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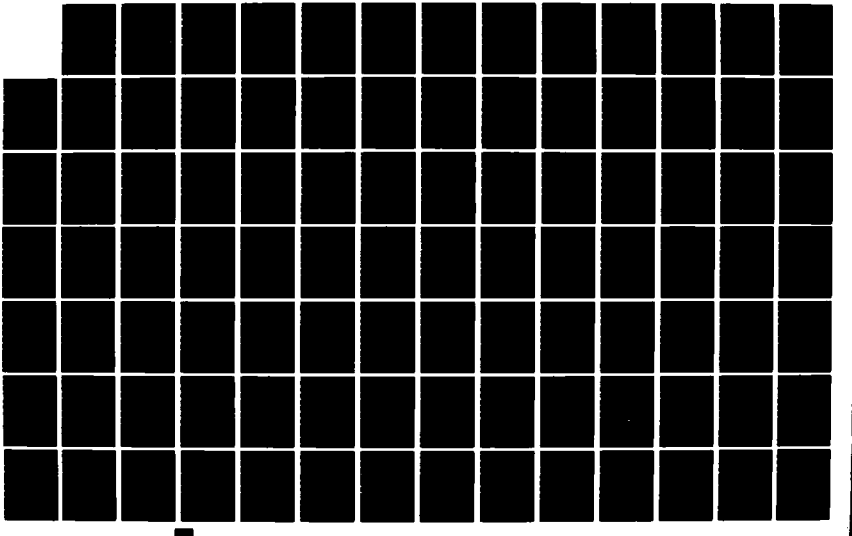
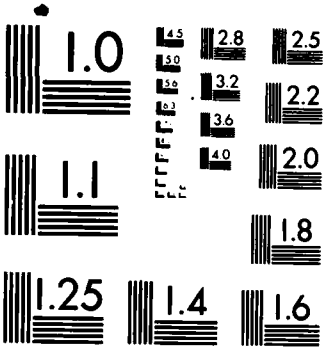
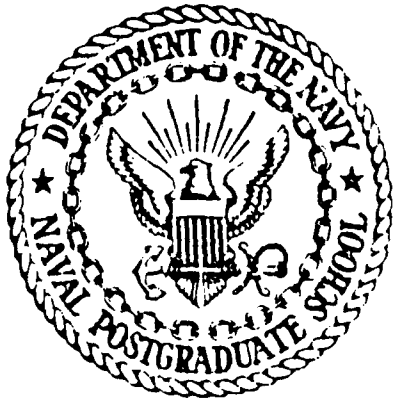




NPS-68-85-026

NAVAL POSTGRADUATE SCHOOL

Monterey, California



HYDROGRAPHIC DATA FROM THE OPTOMA PROGRAM
OPTOMA17
OPTOMA17 P 21 July 1985
OPTOMA17 Leg DI 10 - 22 August 1985
OPTOMA17 Leg DII 23 August - 5 September 1985

by

Paul A. Wittmann
Edward A. Kelley, Jr.
Christopher N.K. Mooers

October 1985

Approved for public release; distribution unlimited.

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Arlington, VA 22217

NAVAL POSTGRADUATE SCHOOL

Monterey, California 93943

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Hydrographic Data from the **OPTOMA** *Program:*

OPTOMA17

21 July - 5 September, 1985

by

Paul A. Wittmann
Edward A. Kelley, Jr.
Christopher N. K. Mooers

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The **OPTOMA** Program is a joint program of

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The two cruises, Leg DI and DII, and one AXBT flight Leg P were undertaken in July, August, and September 1985. THis report presents the hydrographic data acquired by XBT, AXBT and CTD casts, from the cruises and the flights.

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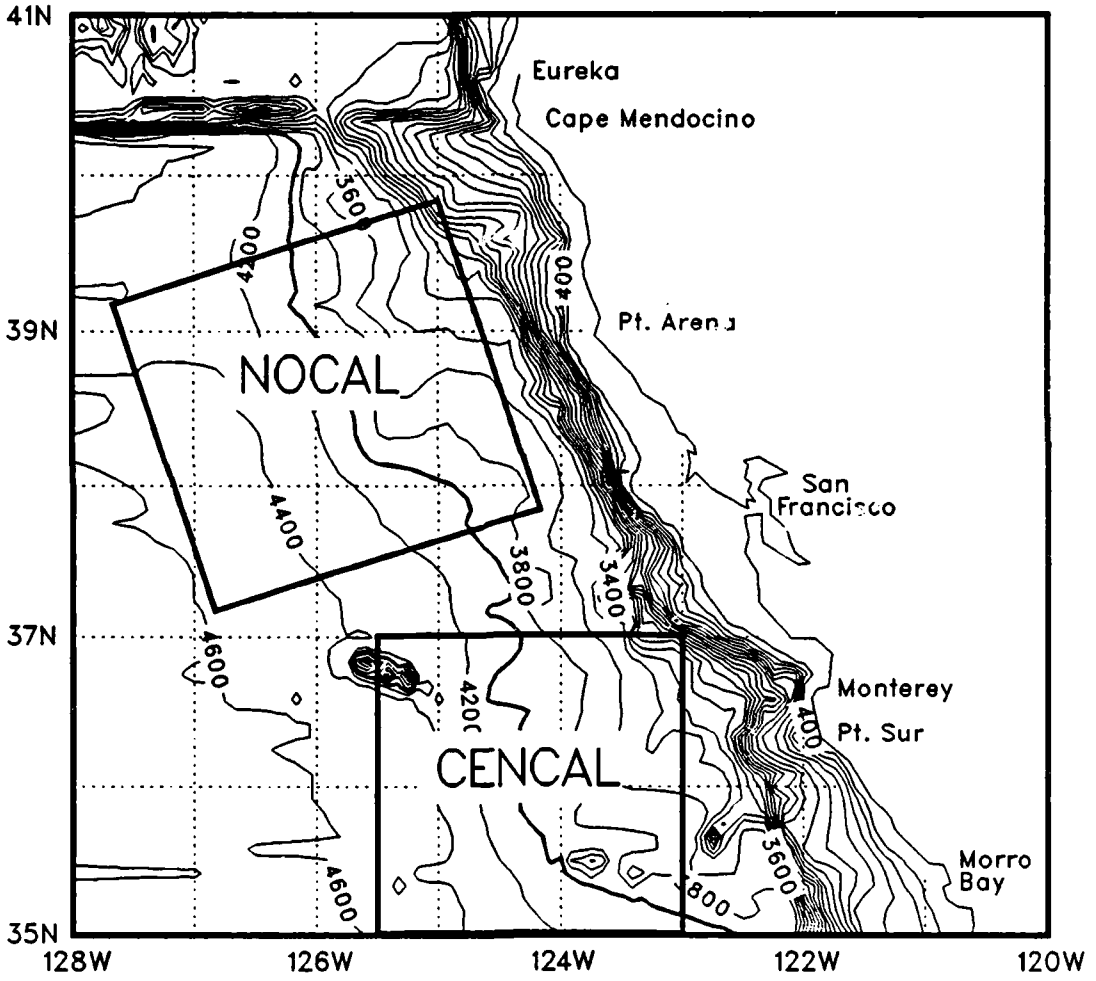


Figure 1: The NOCAL and CENCAL subdomains of the OPTOMA Program. Isobaths are shown in meters.

INTRODUCTION

The OPTOMA (Ocean Prediction Through Observations, Modeling and Analysis) Program, a joint NPS/Harvard program sponsored by ONR, seeks to understand the mesoscale (fronts, eddies, and jets) variability and dynamics of the California Current System and to determine the scientific limits to practical mesoscale ocean forecasting. To help carry out the aims of this project, a series of cruises has been planned in two subdomains, NOCAL and CENCAL, shown in Figure 1.

The two cruises and one AXBT flight comprising OPTOMA17 were undertaken, during July, August and September 1985, in the USNS DE STEIGUER and a Reserve Patrol Wing P3B aircraft. Hydrographic data were acquired off the coast of California in an area which covered and extended the NOCAL region.

Leg P was carried out on 21 July, Leg DI from 10 to 22 August, and Leg DII from 23 August to 5 September. Legs P, DI and DII sampled areas approximately 270 km square, 270 km by 360 km, and 320 km by 360 km, respectively. The sampled areas were roughly centered about 190 km off the coast from Pt. Arena.

On each cruise track, transect extremes are identified by letter to aid in cross-referencing the data presented in subsequent figures. On each of these cruises, hydrographic stations were occupied at approximately 19 km along the track. For the AXBT flight, the along-track station spacing varied between about 28 km and about 46 km.

DATA ACQUISITION

Data acquired during Legs DI and DII include XBT and CTD profiles; whereas data acquired during Leg P are AXBT profiles. Bucket surface temperatures were taken at all CTD stations. A rosette sampler was used to acquire deep salinity samples. These salinity samples were used for calibration purposes as well as contributions to the data base.

The XBT and AXBT data were digitized using a Sippican MK9 unit, recorded on data disks using a HP200 series computer, and transferred ashore to the IBM 3033 mainframe computer at the Naval Postgraduate School for editing and processing.

Station positions were determined by Loran C fixes and are claimed to be accurate to within about 0.1 km. A NAVOCEANO Neil Brown CTD was used on the cruises. Table 1 on page 6 summarizes the various sensors used on the USNS DE STEIGUER and their accuracy. The salinity samples were determined by a Guildline Model 8400 "Autosal" salinometer with an accuracy of $\pm$0.003ppt at the Naval Postgraduate School.

During Leg P, shallow (305 m) and deep (750 m) AXBT's were deployed. The aircraft maintained an altitude of approximately 400 ft and an airspeed of approximately 190 knots. Station positions are accurate to within 1 km, temperature values to within 0.2°C and depth values to within 2% or 5 m (whichever is larger).

DATA PROCESSING

The data processing, such as estimating depth profiles for the XBT and AXBT temperature profiles based on descent speed, and conversion of CTD conductivity to salinity using the algorithm given in Lewis and Perkin (1981), was carried out on the IBM 3033. The data were then edited by removing obvious salinity spikes and eliminating cast failures that were not identified during the cruise. Approximately 99%, 100%, and 100% of casts were retained in the data sets of Legs P, DI, and DII, respectively. From a comparison of the CTD salinities with the salinity samples from the bottles, it was determined that the CTD salinities had an offset of -.02 ppt. The salinities were adjusted accordingly. The CTD data were interpolated to 5 m intervals and then up and down casts were averaged.

The data have been transferred on digital tape to the National Oceanographic Data Center in Washington, DC.

DATA PRESENTATION

The cruise track, station locations (with XBT's, CTD's and AXBT's identified) and station numbers are shown in the first three figures of each of the next three sections, which present the data from Legs P, DI and DII, respectively. These figures are followed by a listing of the stations, with their coordinates, the date and time at which the station was occupied, and the surface information obtained at the station.

Vertical profiles of temperature from the XBT casts are shown in staggered fashion. The location of these profiles may be found by reference to the various maps of the cruise tracks. Transect extremes are identified as nearly as possible. The first profile on each plot is shown with its temperature unchanged; to each subsequent profile an appropriate multiple of 5C has been added. Vertical profiles from the CTD's follow (except Leg P). Profiles of temperature are staggered by 5C and those of salinity by 4 ppt.

Isotherms for each transect are shown in the next pages, followed (except Leg P) by isopleths of temperature, salinity and sigma-t, from the CTD's, when four or more casts were acquired along a transect. Based on instrument accuracy and the vertical temperature gradient, it is estimated that depths of isotherms in the main thermocline are uncertain to $\pm$20m. The tick marks identify station positions and, again, the transect extremes are shown on these plots.

Each section includes mean profiles of temperature from the XBT's. In addition, for Sections 1 and 3, mean profiles of temperature, salinity and sigma-t from the CTD's are given, as well as a scatter diagram of the T-S pairs

and the mean S(T) curve, with the $\pm$ standard deviation envelope; the data presentation concludes with a plot of the mean N^2 (Brunt-Vaisala frequency squared) profile, with $\pm$ the standard deviation. On the sigma-t and N^2 plots, the appropriate profiles derived from the mean temperature and mean salinity profiles are also shown.

Table 1: Scientific instruments aboard the USNS DE STEIGUER

Instrument	Variable	Sensor	Accuracy	Resolution
Neil Brown	pressure	strain gage	1.6 db	0.025 db
CTD	temperature	thermistor	0.005 C	0.0005 C
Mark IIIb	conductivity	electrode cell	0.005 mmho	0.001 mmho
Sippican	temperature	thermistor	0.2 C	
BT	depth	descent speed	greater of 4.6 m and 2% of depth	

Section 1

OPTOMA17 Leg P

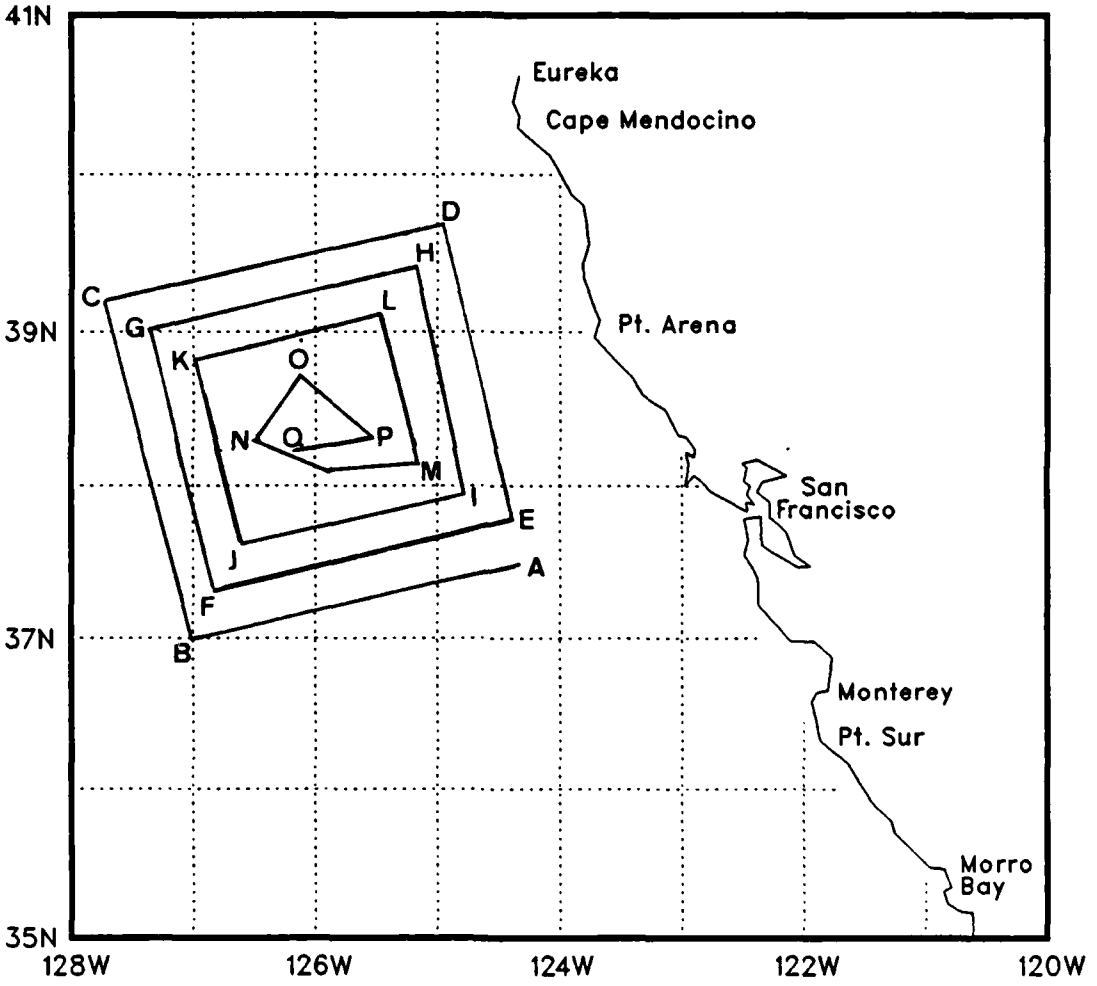


Figure 2: The flight track for OPTOMA17, Leg P.

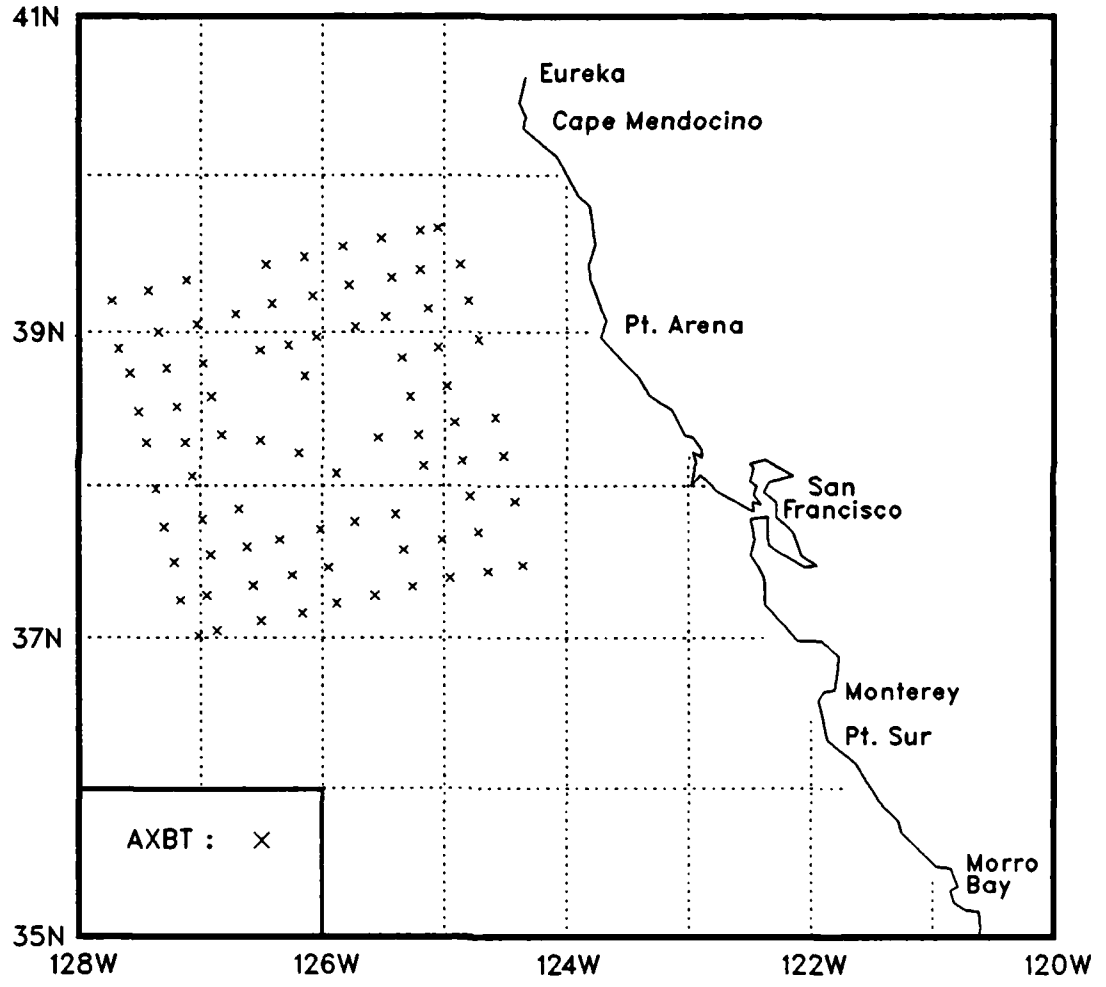


Figure 3: AXBT locations for OPTOMA17, Leg P.

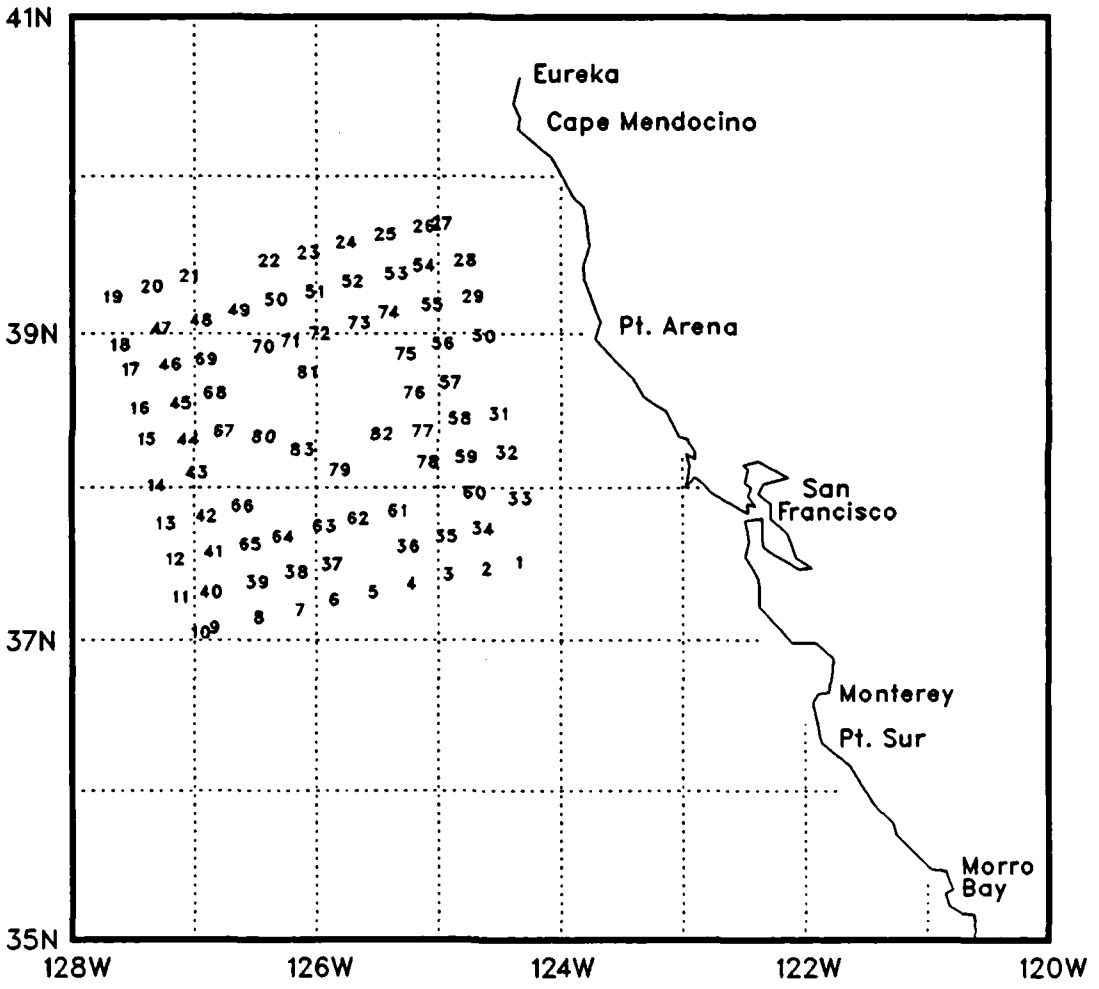


Figure 4: Station numbers for OPTOMA17, Leg P.

Table 2: Leg P Station Listing

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)
1	AXBT	85202	1547	37.29	124.21	14.0
2	AXBT	85202	1552	37.26	124.38	14.4
3	AXBT	85202	1556	37.24	124.57	15.5
4	AXBT	85202	1602	37.20	125.15	15.8
5	AXBT	85202	1606	37.17	125.34	15.8
6	AXBT	85202	1620	37.14	125.53	15.9
7	AXBT	85202	1624	37.10	126.10	15.6
8	AXBT	85202	1629	37.07	126.30	15.3
9	AXBT	85202	1634	37.03	126.52	16.0
10	AXBT	85202	1640	37.01	127.01	16.1
11	AXBT	85202	1649	37.15	127.10	14.1
12	AXBT	85202	1655	37.30	127.13	15.4
13	AXBT	85202	1700	37.44	127.18	13.8
14	AXBT	85202	1705	37.59	127.22	15.7
15	AXBT	85202	1711	38.17	127.27	16.1
16	AXBT	85202	1715	38.29	127.31	15.8
17	AXBT	85202	1719	38.44	127.35	16.2
18	AXBT	85202	1725	38.54	127.41	16.2
19	AXBT	85202	1729	39.12	127.44	16.3
20	AXBT	85202	1734	39.16	127.26	15.8
21	AXBT	85202	1739	39.20	127.07	16.3
22	AXBT	85202	1748	39.26	126.28	16.1
23	AXBT	85202	1753	39.29	126.09	16.1
24	AXBT	85202	1757	39.33	125.50	16.0
25	AXBT	85202	1802	39.36	125.31	15.6
26	AXBT	85202	1807	39.39	125.12	15.3
27	AXBT	85202	1811	39.40	125.03	14.3
28	AXBT	85202	1815	39.26	124.52	14.7
29	AXBT	85202	1820	39.12	124.48	14.7
30	AXBT	85202	1825	38.57	124.43	14.9
31	AXBT	85202	1834	38.27	124.35	12.9
32	AXBT	85202	1838	38.12	124.31	14.7
33	AXBT	85202	1843	37.54	124.25	14.5
34	AXBT	85202	1852	37.42	124.43	14.1
35	AXBT	85202	1857	37.39	125.01	14.8
36	AXBT	85202	1901	37.35	125.20	15.0
37	AXBT	85202	1911	37.28	125.57	15.8
38	AXBT	85202	1915	37.25	126.15	15.7
39	AXBT	85202	1920	37.21	126.34	15.5
40	AXBT	85202	1924	37.17	126.57	14.8
41	AXBT	85202	1929	37.33	126.55	14.9
42	AXBT	85202	1934	37.47	126.59	14.8
43	AXBT	85202	1939	38.04	127.04	15.0
44	AXBT	85202	1943	38.17	127.08	15.9
45	AXBT	85202	1947	38.31	127.12	16.2

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)
46	AXBT	85202	1952	38.46	127.17	16.0
47	AXBT	85202	1957	39.00	127.21	16.9
48	AXBT	85202	2001	39.03	127.02	16.0
49	AXBT	85202	2006	39.07	126.43	16.2
50	AXBT	85202	2010	39.11	126.25	16.2
51	AXBT	85202	2015	39.14	126.05	16.3
52	AXBT	85202	2019	39.18	125.47	15.9
53	AXBT	85202	2024	39.21	125.26	15.7
54	AXBT	85202	2027	39.24	125.12	15.3
55	AXBT	85202	2032	39.09	125.08	14.9
56	AXBT	85202	2037	38.54	125.03	14.9
57	AXBT	85202	2041	38.39	124.59	14.9
58	AXBT	85202	2046	38.25	124.55	14.2
59	AXBT	85202	2050	38.10	124.51	14.9
60	AXBT	85202	2054	37.56	124.47	14.6
61	AXBT	85202	2104	37.49	125.24	15.4
62	AXBT	85202	2109	37.46	125.44	16.1
63	AXBT	85202	2113	37.43	126.01	15.6
64	AXBT	85202	2118	37.39	126.21	16.0
65	AXBT	85202	2122	37.36	126.37	16.0
66	AXBT	85202	2127	37.51	126.41	15.3
67	AXBT	85202	2136	38.20	126.50	15.5
68	AXBT	85202	2141	38.35	126.55	16.2
69	AXBT	85202	2145	38.48	126.59	16.0
70	AXBT	85202	2151	38.53	126.31	15.9
71	AXBT	85202	2154	38.55	126.17	16.4
72	AXBT	85202	2159	38.58	126.03	16.1
73	AXBT	85202	2203	39.02	125.44	15.2
74	AXBT	85202	2208	39.06	125.29	14.8
75	AXBT	85202	2213	38.50	125.21	14.8
76	AXBT	85202	2217	38.35	125.17	13.2
77	AXBT	85202	2222	38.20	125.13	14.0
78	AXBT	85202	2225	38.08	125.10	15.1
79	AXBT	85202	2237	38.05	125.53	15.5
80	AXBT	85202	2247	38.18	126.31	16.0
81	AXBT	85202	2256	38.43	126.09	16.1
82	AXBT	85202	2307	38.19	125.33	13.5
83	AXBT	85202	2317	38.13	126.12	14.6

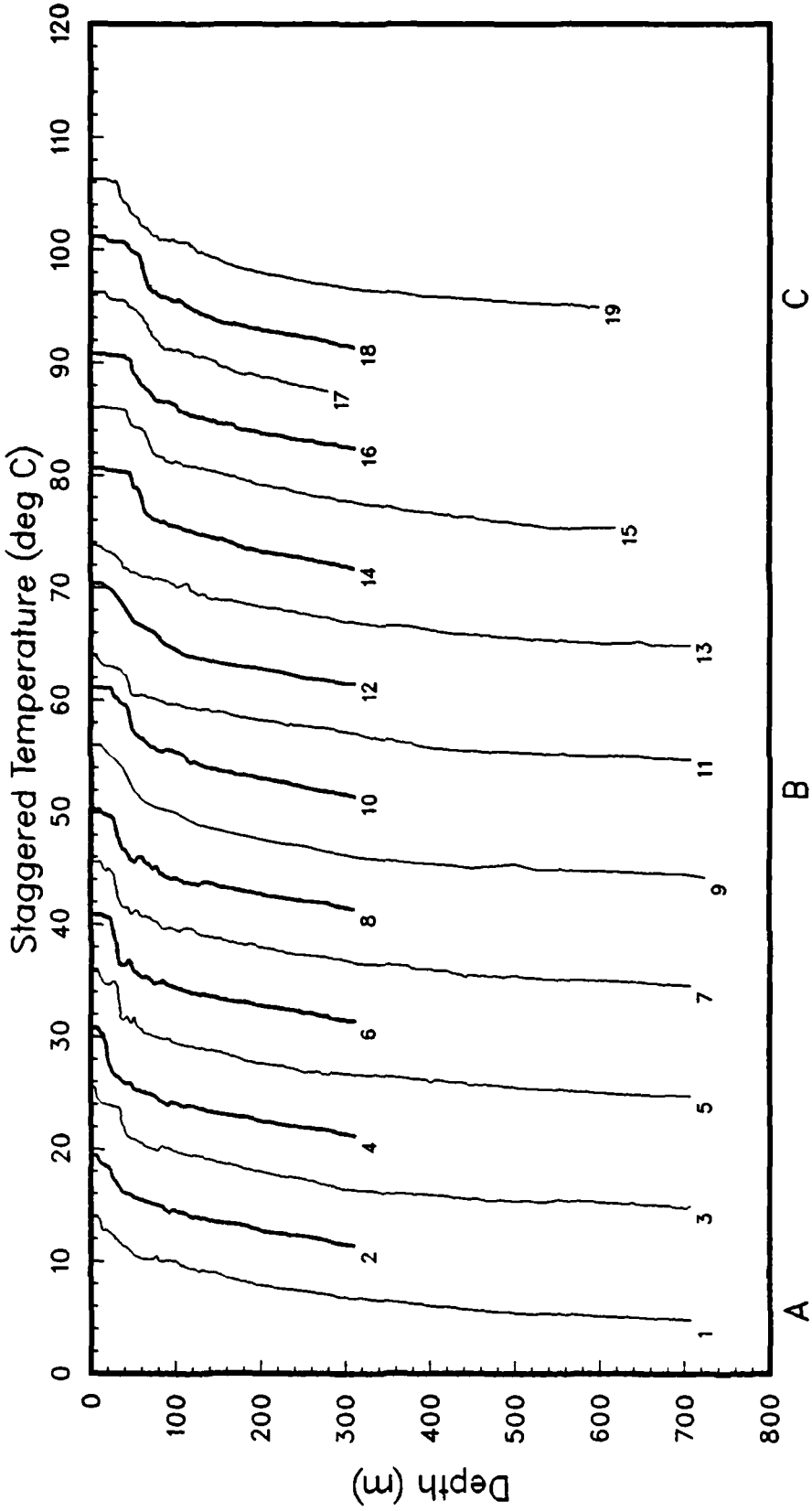
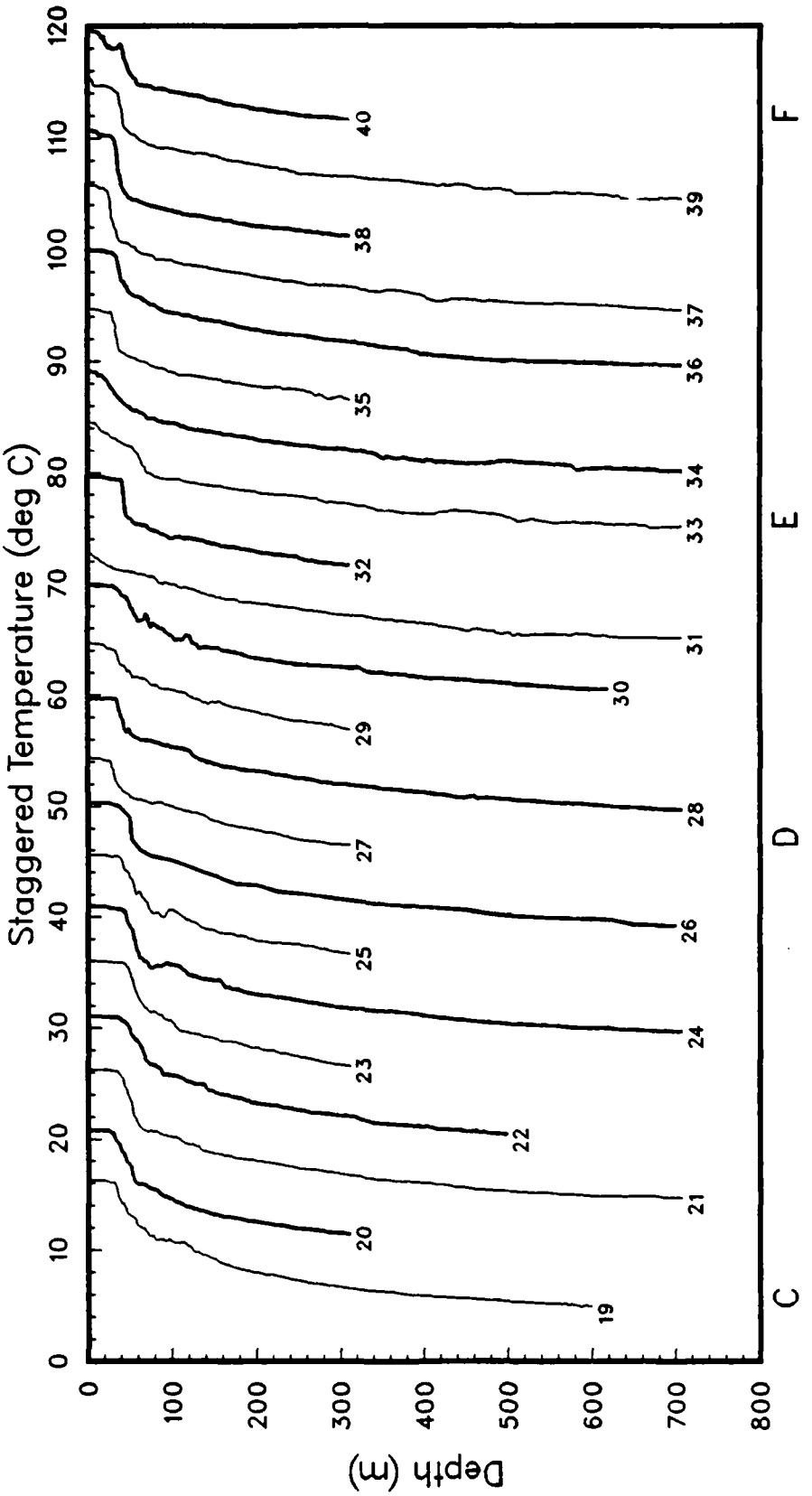


Figure 5(a): AXBT temperature profiles, staggered by multiples of 5C (OPTOMA17, Leg P).


Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
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200
300
400
500
600
700
800
19
20
21
22
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C
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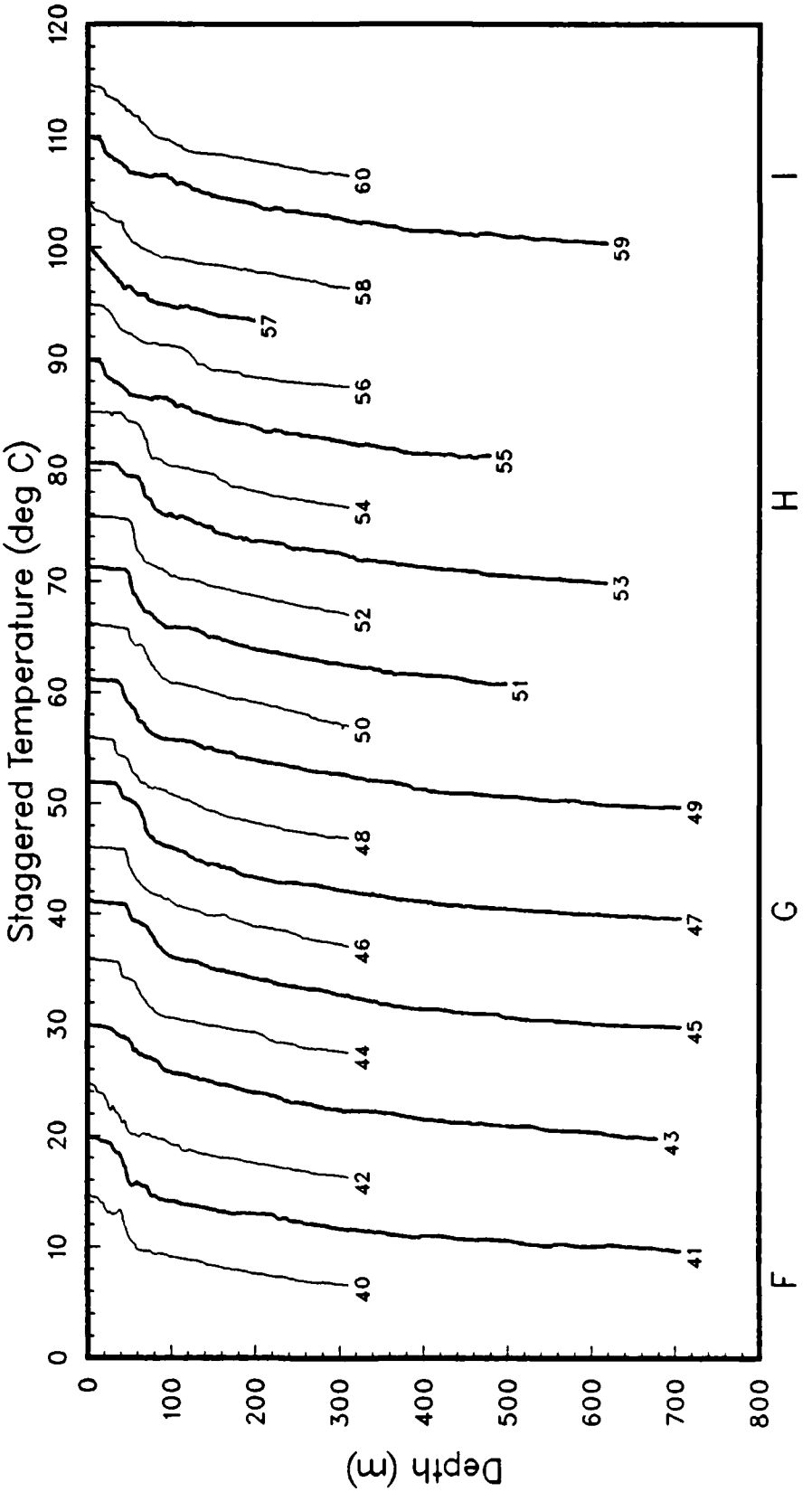
Figure 5(b)


Staggered Temperature (deg C)
Depth (m)
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60
70
80
90
100
110
120
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100
200
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700
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Figure 5(c)

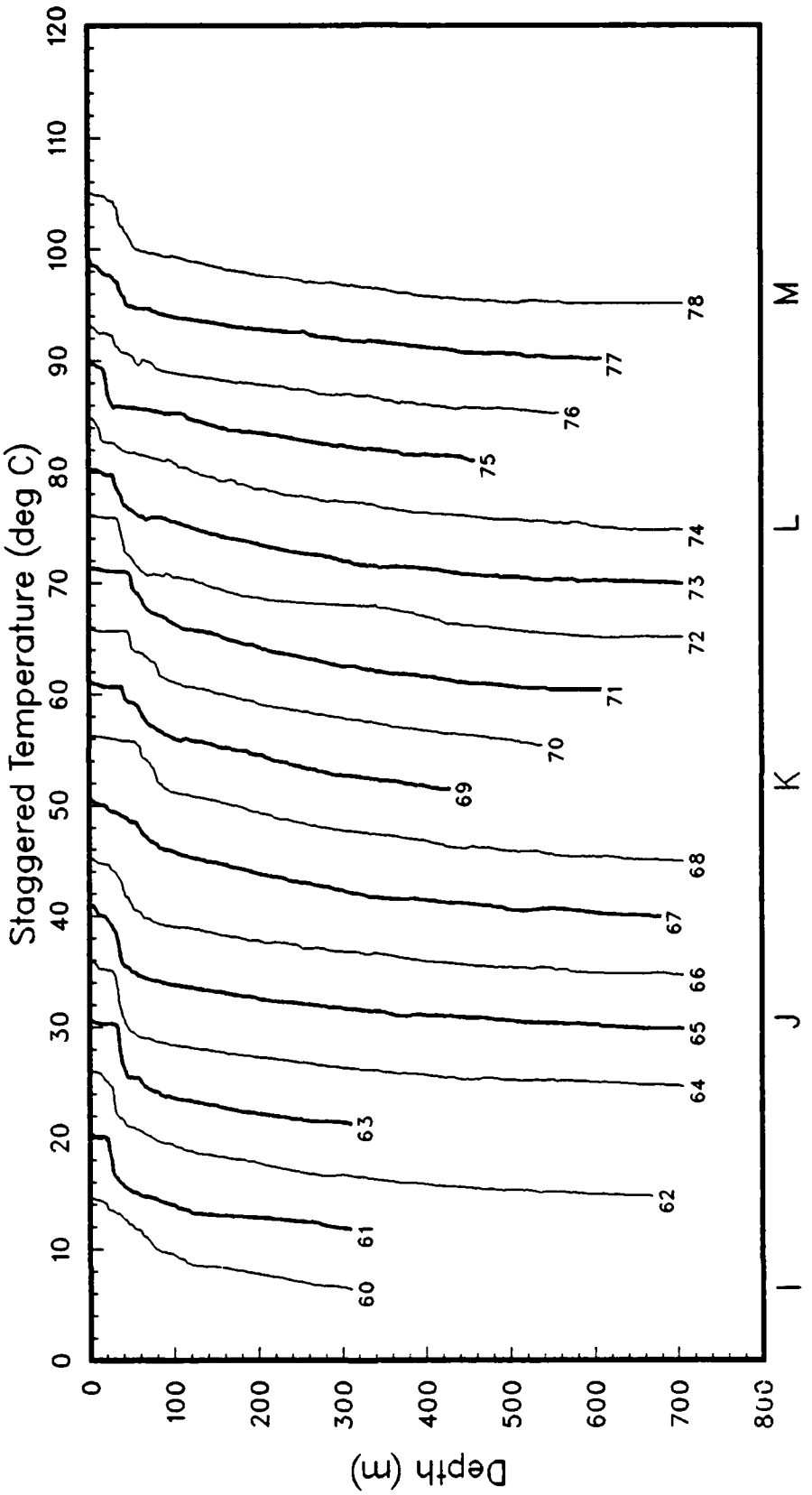
Staggered Temperature (deg C)
Depth (m)
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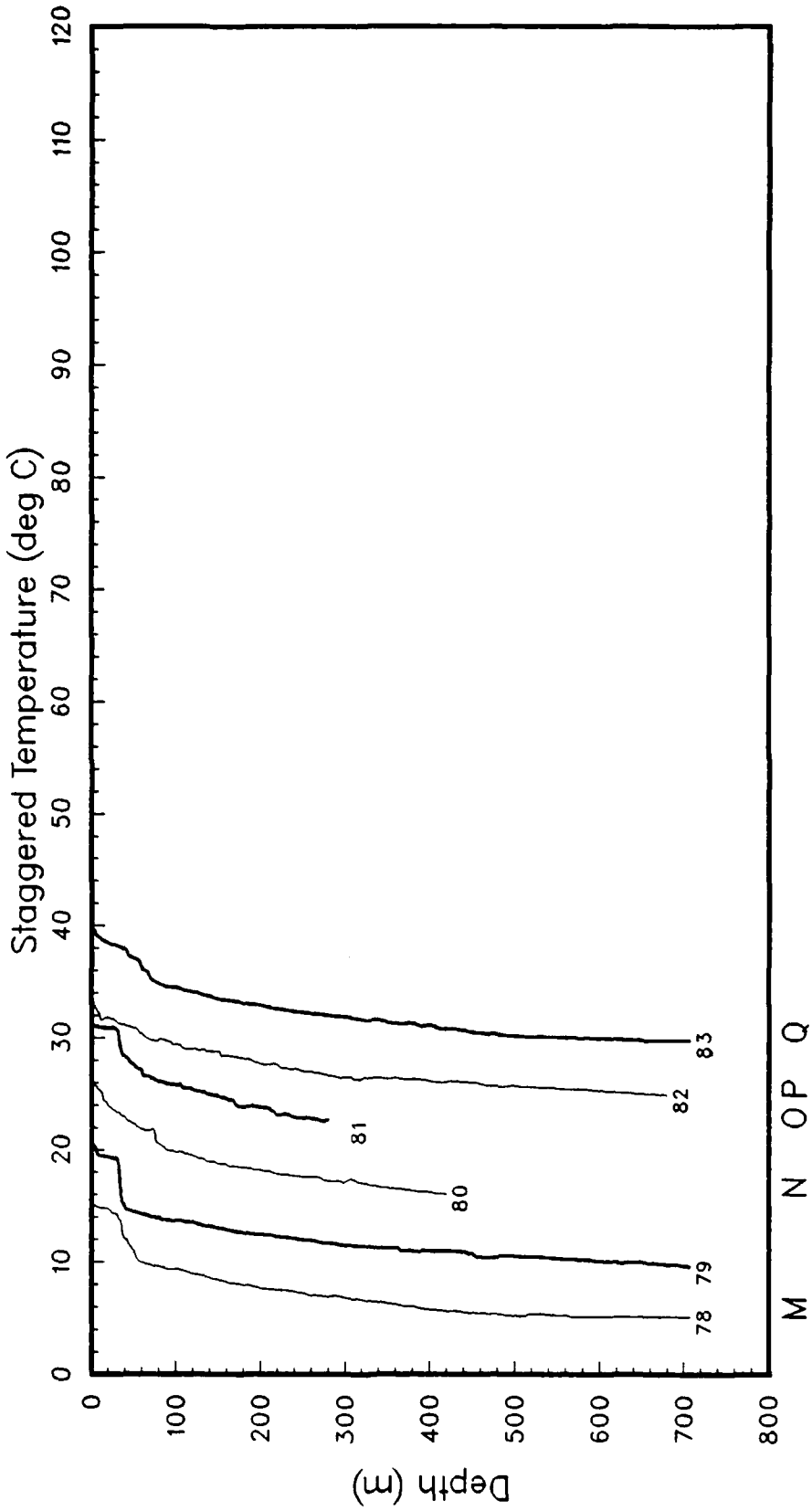
Figure 5(d)


Staggered Temperature (deg C)
0
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20
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40
50
60
70
80
90
100
110
120
Depth (m)
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200
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P
Q
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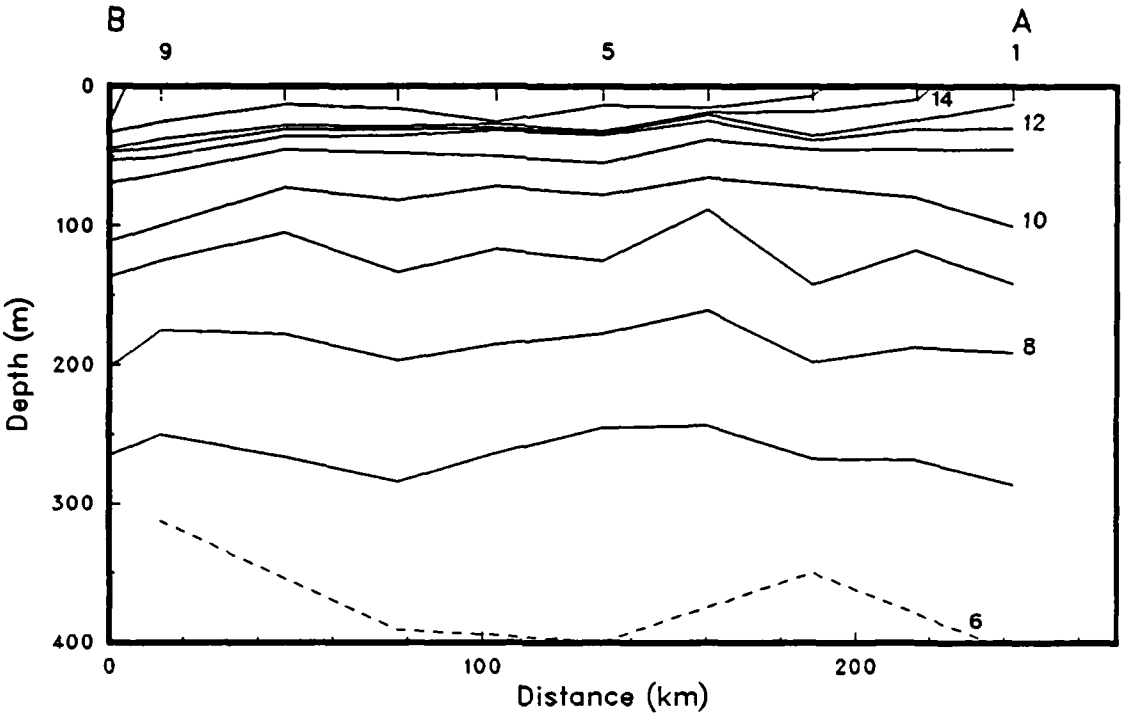
83

Figure 5(e)



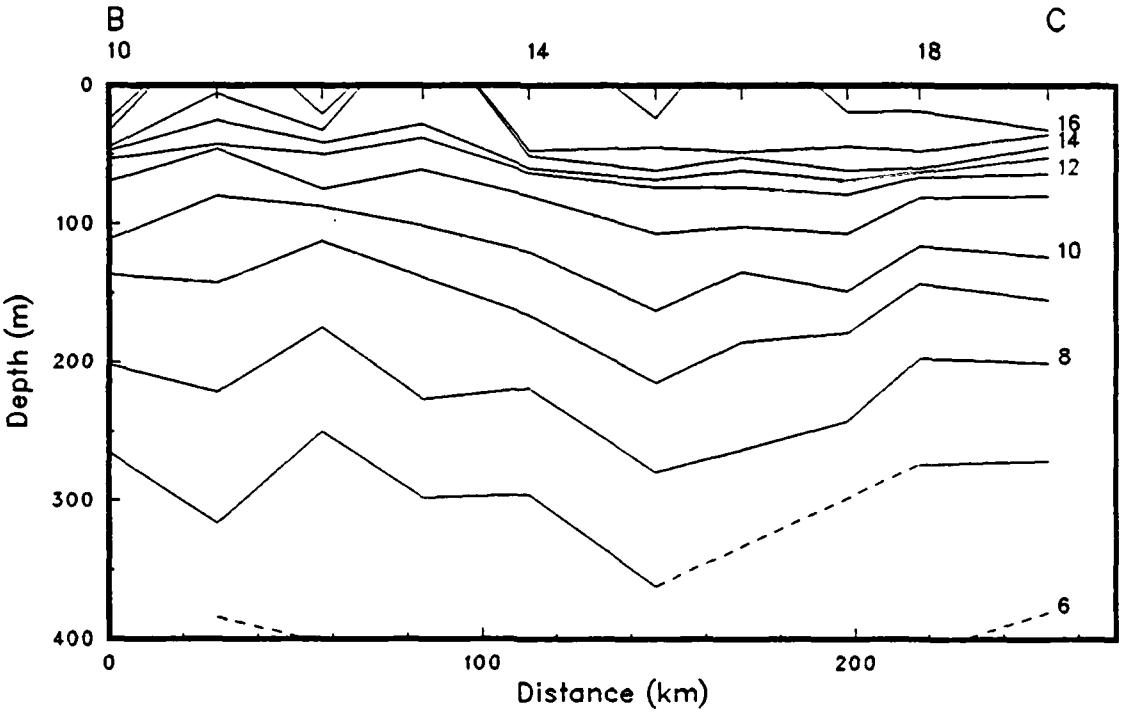
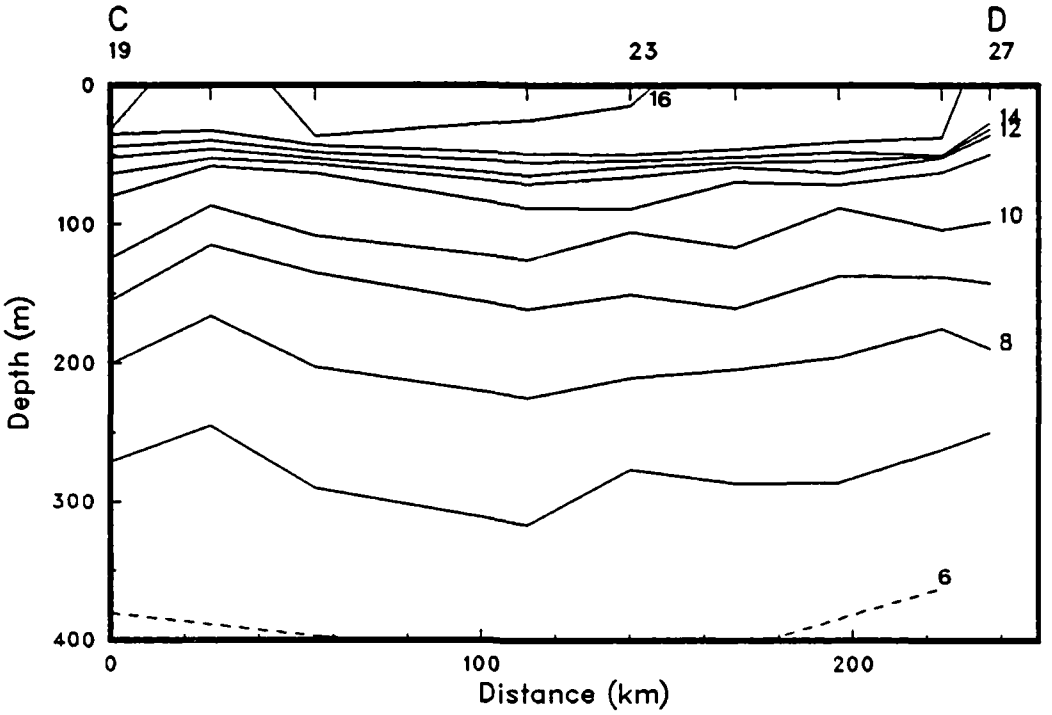


Figure 6(a)-(b): Along-track isotherms. Tick marks along the upper horizontal axis show station positions. Some station numbers are given. Dashed lines are used if the cast was too shallow (OPTOMA17, Leg P).



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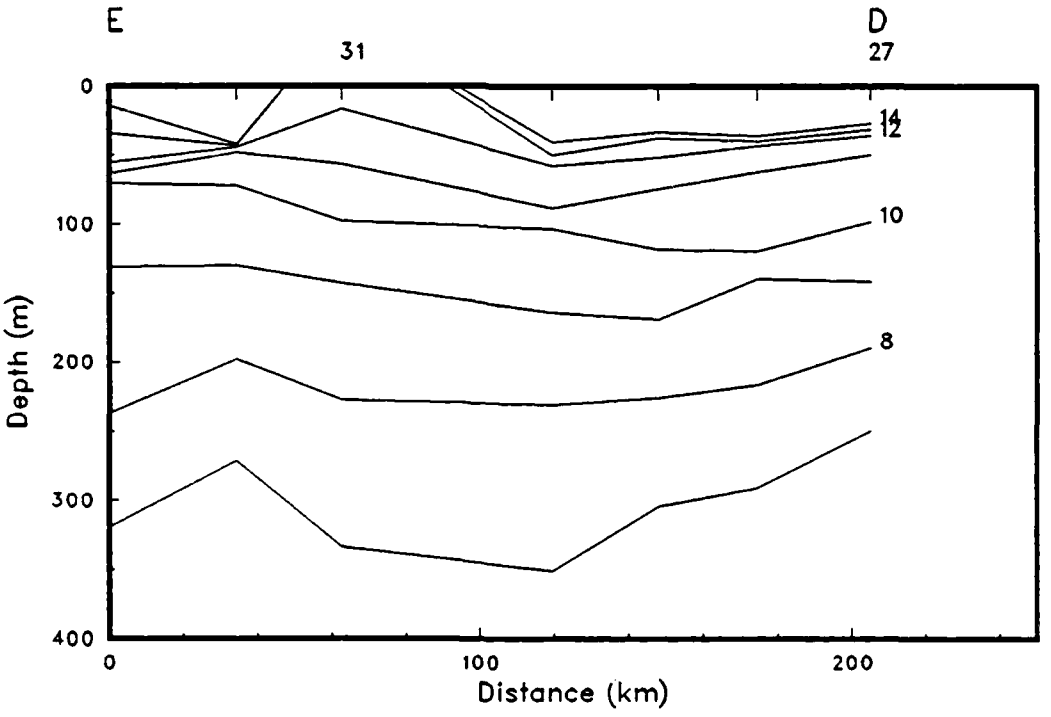

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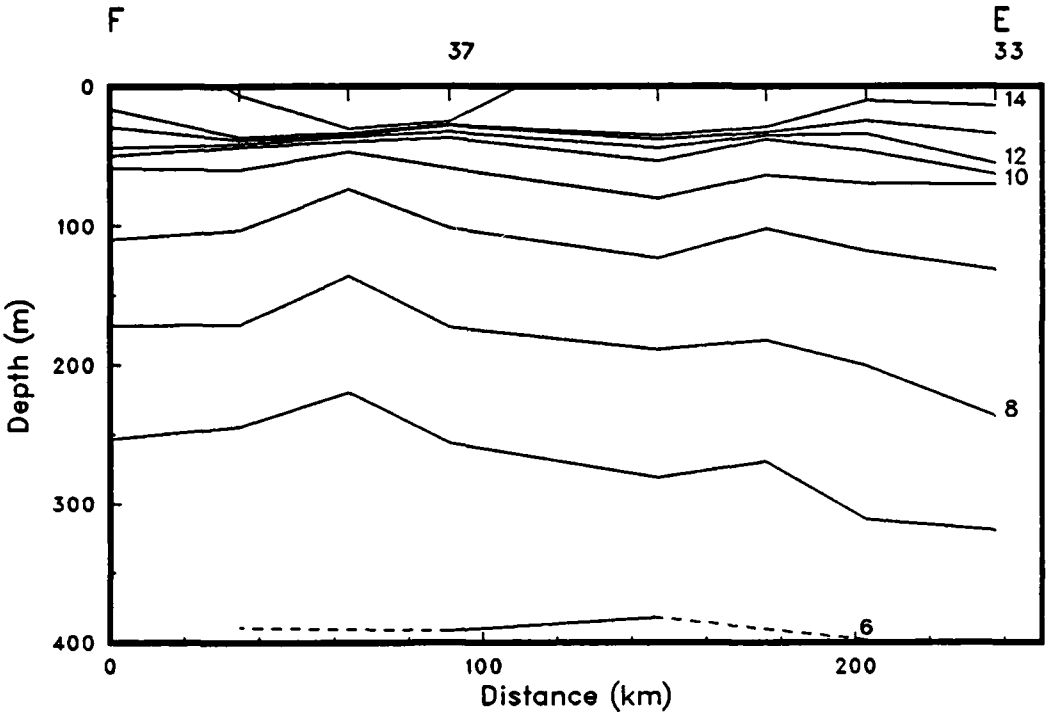

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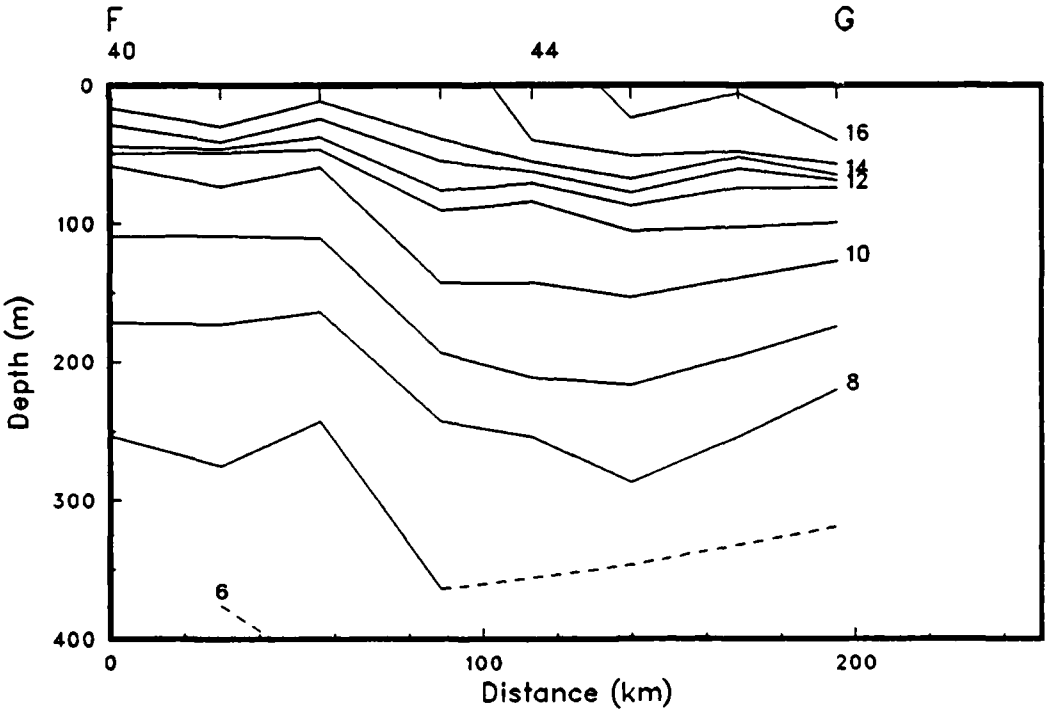

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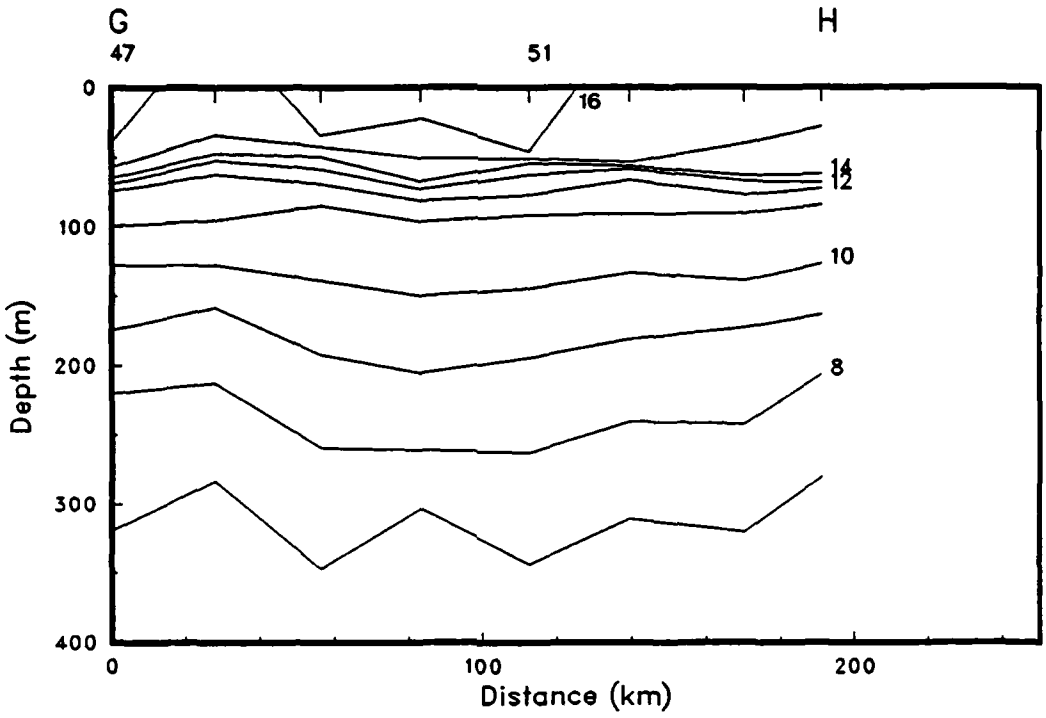


Figure 6(g)

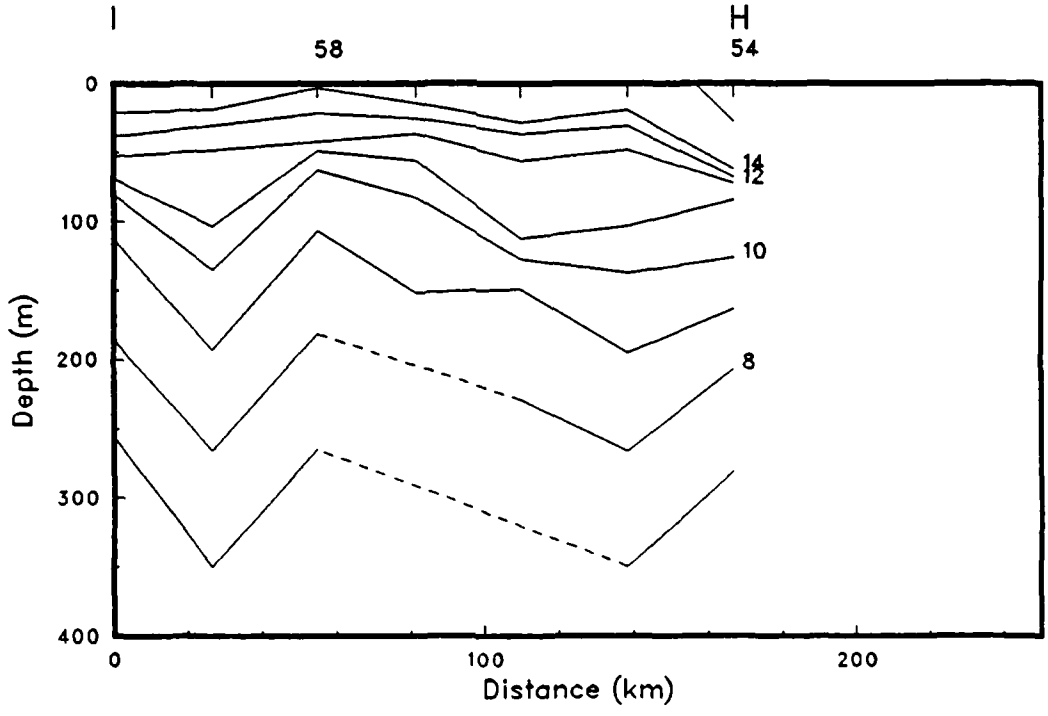


Figure 6(h)

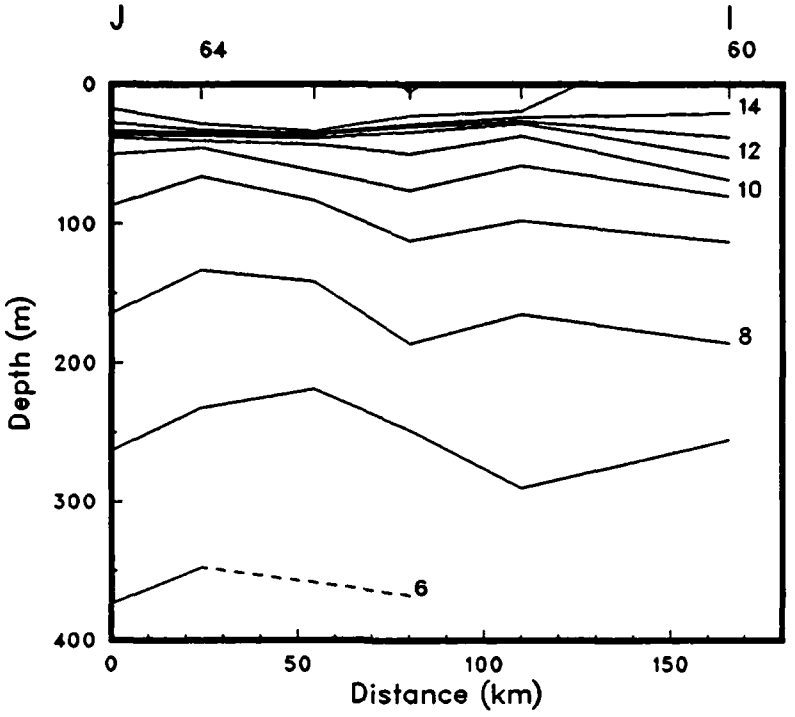


Figure 6(i)

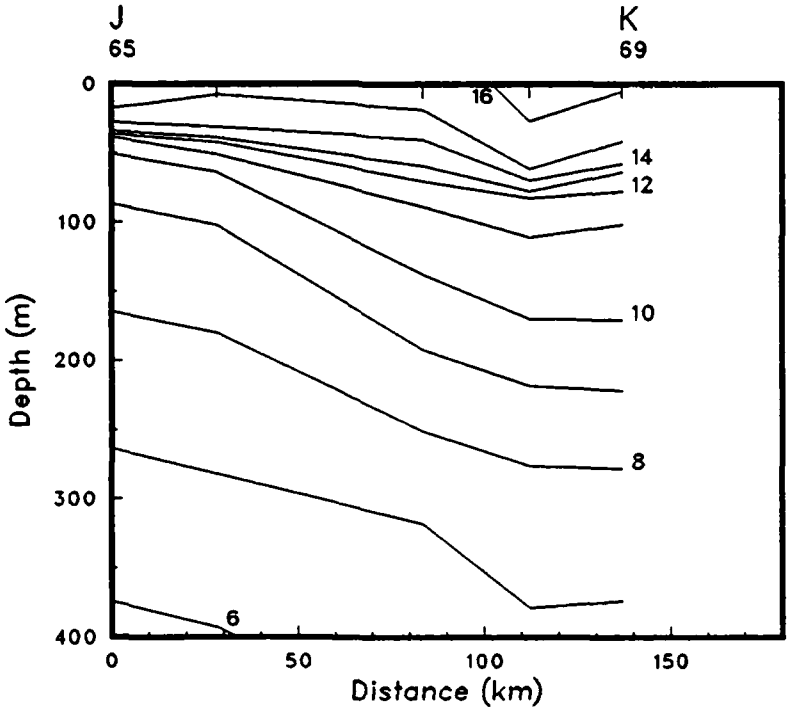


Figure 6(j)

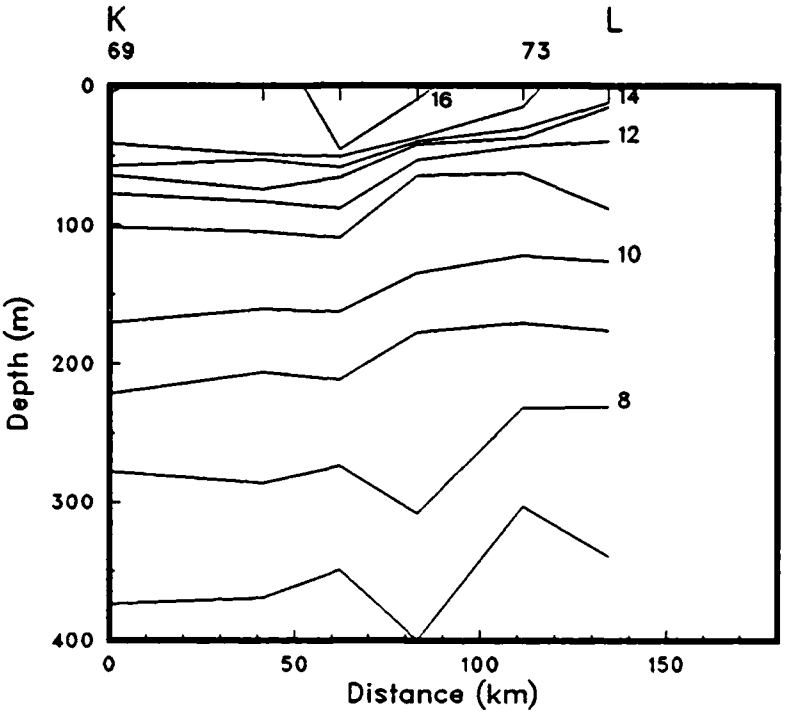


Figure 6(k)

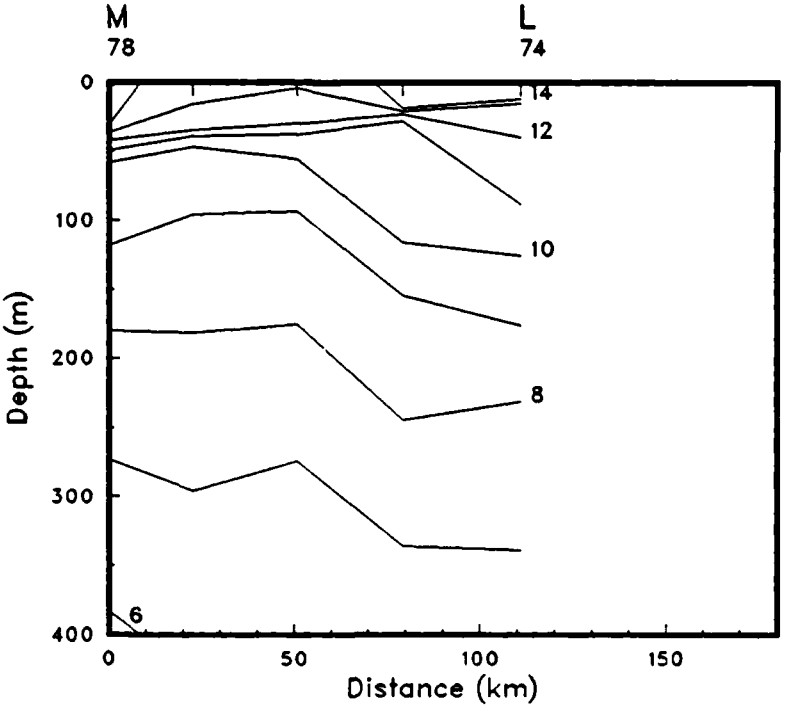


Figure 6(l)

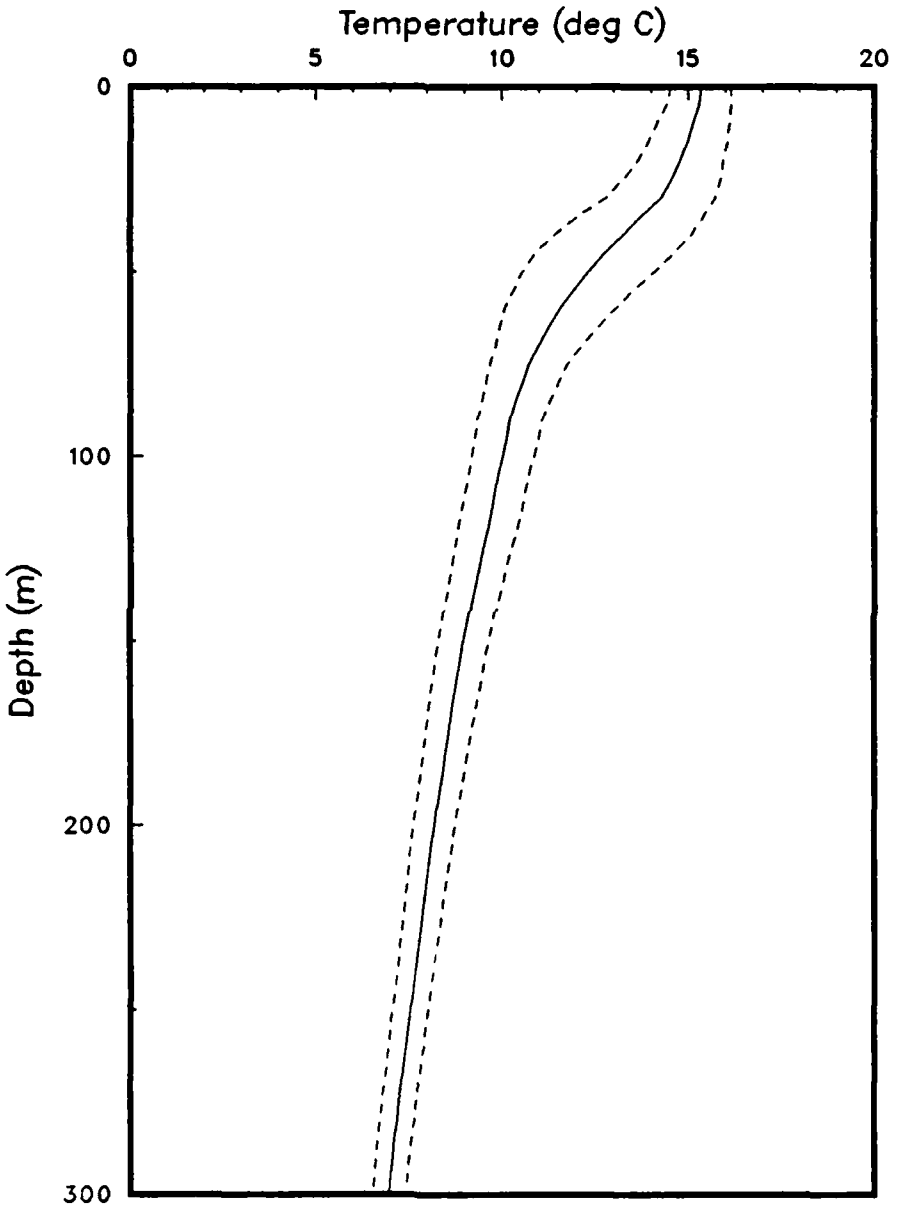


Figure 7: Mean temperature profile, with + and - the standard deviation. (OPTOMA17, Leg P).

Section 2

OPTOMA17 Leg DI

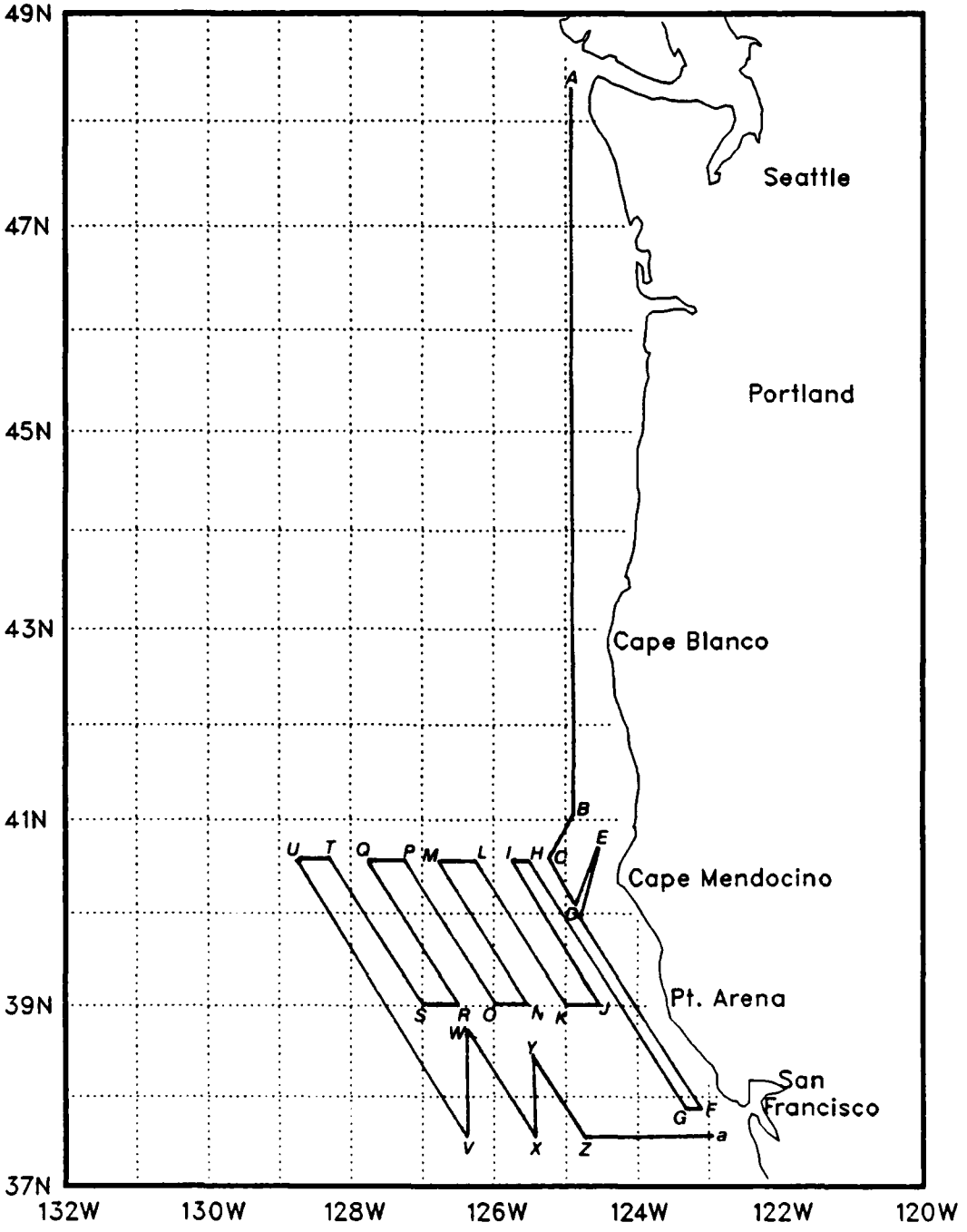


Figure 8: The cruise track for OPTOMA17, Leg DI.

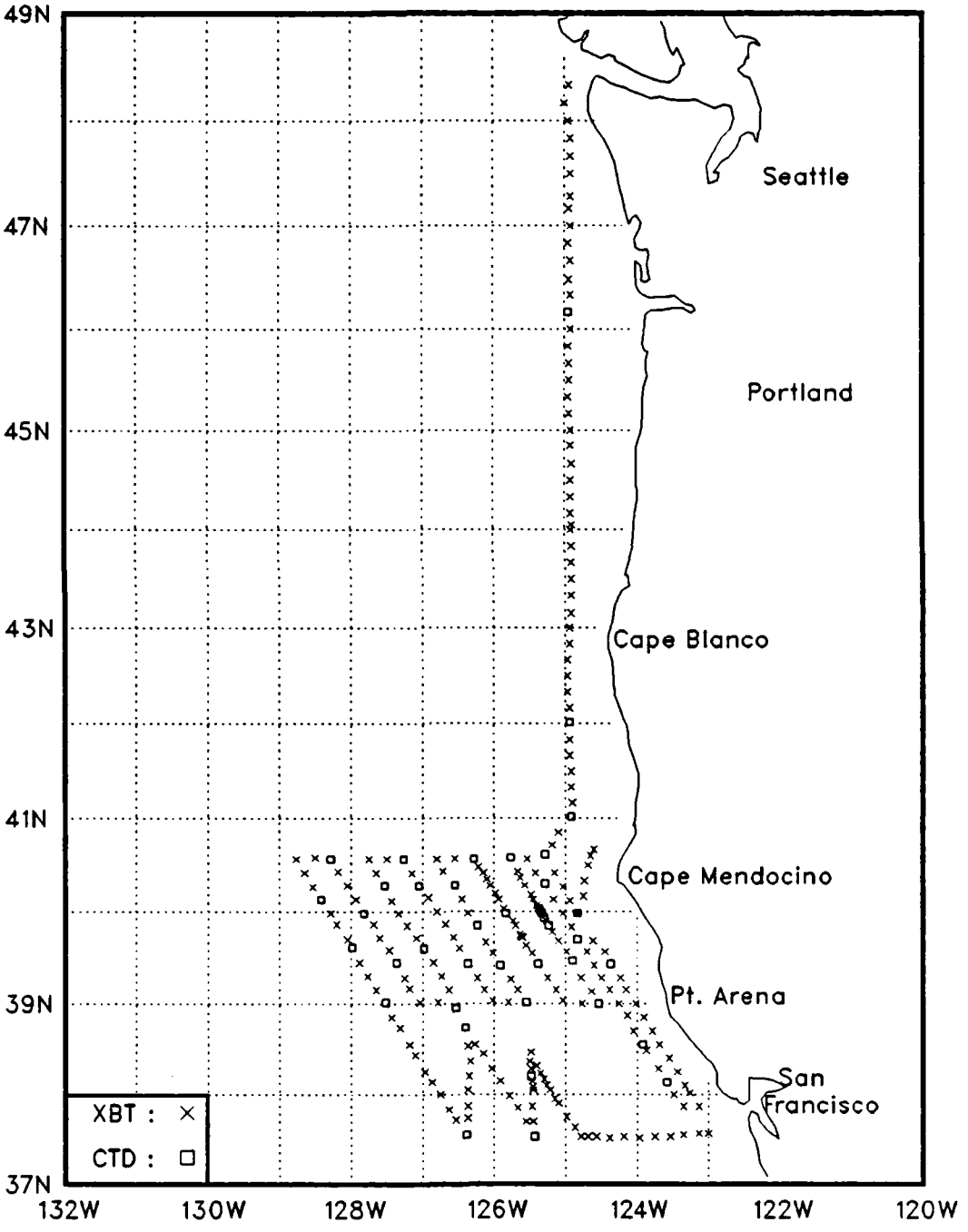


Figure 9: XBT and CTD locations for OPTOMA17, Leg DI.

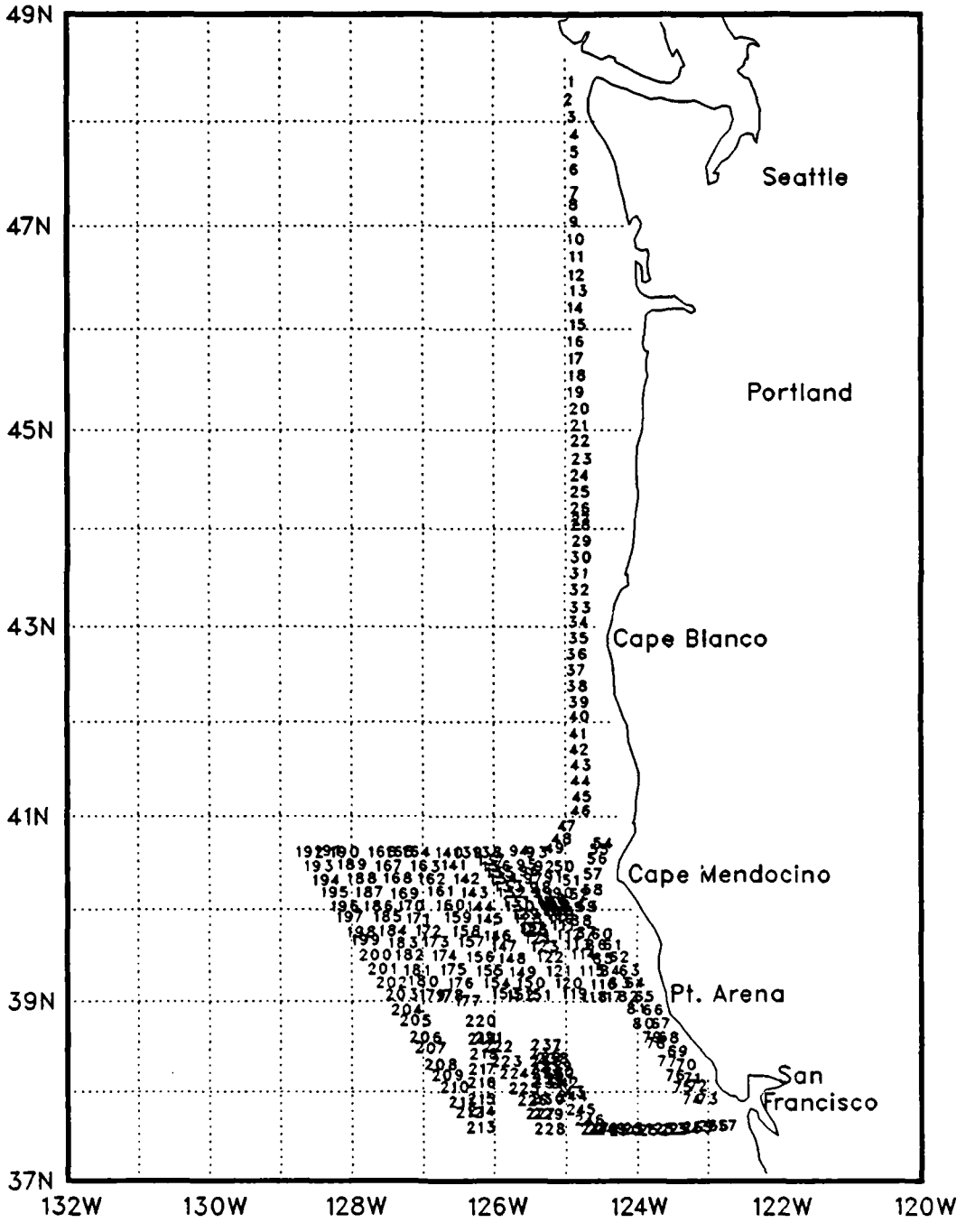


Figure 10: Station numbers for OPTOMA17, Leg DI.

Table 3: Leg DI Station Listing

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	DEEP SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
1	XBT	85223	606	48.20	124.56	13.6			
2	XBT	85223	715	48.10	125.00	13.4			
3	XBT	85223	805	48.00	124.57	13.3			
4	XBT	85223	852	47.50	124.55	12.9			
5	XBT	85223	947	47.40	124.55	13.0			
6	XBT	85223	1040	47.30	124.55	13.4			
7	XBT	85223	1147	47.17	124.55	12.8			
8	XBT	85223	1231	47.10	124.56	13.2			
9	XBT	85223	1323	47.00	124.55	12.7			
10	XBT	85223	1422	46.50	124.57	14.2			
11	XBT	85223	1514	46.40	124.55	15.6			
12	XBT	85223	1614	46.29	124.56	15.9			
13	XBT	85223	1705	46.20	124.55	15.9			
14	CTD	85223	1844	46.10	124.57	15.8	34.08	16.4	34.08
15	XBT	85223	2041	46.00	124.55	15.6			
16	XBT	85223	2141	45.50	124.57	15.6			
17	XBT	85223	2230	45.40	124.56	16.3			
18	XBT	85223	2341	45.30	124.56	16.2			
19	XBT	85224	36	45.20	124.57	16.6			
20	XBT	85224	126	45.10	124.56	17.2			
21	XBT	85224	218	45.00	124.55	17.3			
22	XBT	85224	310	44.51	124.55	17.2			
23	XBT	85224	400	44.40	124.54	16.5			
24	XBT	85224	456	44.30	124.55	15.1			
25	XBT	85224	544	44.20	124.55	14.1			
26	XBT	85224	642	44.10	124.55	12.9			
27	XBT	85224	713	44.03	124.54	14.0			
28	XBT	85224	738	44.00	124.55	14.1			
29	XBT	85224	830	43.50	124.54	13.0			
30	XBT	85224	926	43.40	124.55	13.9			
31	XBT	85224	1025	43.30	124.55	14.1			
32	XBT	85224	1110	43.20	124.55	14.4			
33	XBT	85224	1206	43.09	124.55	14.4			
34	XBT	85224	1256	43.00	124.56	12.3			
35	XBT	85224	1355	42.50	124.56	10.8			
36	XBT	85224	1440	42.40	124.58	11.0			
37	XBT	85224	1538	42.30	124.58	10.1			
38	XBT	85224	1625	42.20	124.58	10.9			
39	XBT	85224	1721	42.10	124.56	10.5			
40	CTD	85224	1830	42.01	124.56	11.2	34.30	11.8	34.30
41	XBT	85224	2011	41.50	124.56	10.5			
42	XBT	85224	2111	41.40	124.56	11.5			
43	XBT	85224	2205	41.30	124.55	11.8			
44	XBT	85224	2302	41.20	124.55	13.0			
45	XBT	85224	2355	41.10	124.54	10.6			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	DEEP SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
46	CTD	85225	117	41.01	124.55	11.0	34.31	11.6	34.31
47	XBT	85225	310	40.51	125.06	12.2			
48	XBT	85225	402	40.43	125.11	14.1			
49	CTD	85225	456	40.37	125.17	14.4	34.33	14.6	34.34
50	XBT	85225	648	40.25	125.09	14.7			
51	XBT	85225	747	40.16	125.02	14.6			
52	XBT	85225	844	40.07	124.56	14.3			
53	CTD	85225	952	39.59	124.50	10.8	34.24	11.4	34.24
54	XBT	85225	1835	40.40	124.36	11.7			
55	XBT	85225	1907	40.36	124.39	12.6			
56	XBT	85225	1942	40.30	124.41	11.8			
57	XBT	85225	2041	40.20	124.44	12.3			
58	XBT	85225	2132	40.10	124.45	11.6			
59	XBT	85225	2343	39.59	124.50	13.3			
60	XBT	85226	41	39.41	124.37	15.3			
61	XBT	85226	127	39.34	124.27	15.7			
62	CTD	85226	236	39.26	124.22	14.4	34.30	14.2	34.32
63	XBT	85226	440	39.17	124.14	12.1			
64	XBT	85226	530	39.09	124.09	11.7			
65	XBT	85226	631	39.00	124.01	11.4			
66	XBT	85226	736	38.51	123.54	11.8			
67	XBT	85226	835	38.42	123.47	12.4			
68	XBT	85226	934	38.33	123.41	10.3			
69	XBT	85226	1031	38.24	123.33	13.5			
70	XBT	85226	1130	38.15	123.26	14.6			
71	XBT	85226	1227	38.06	123.20	14.5			
72	XBT	85226	1306	38.01	123.16	14.1			
73	XBT	85226	1356	37.52	123.08	12.9			
74	XBT	85226	1507	37.52	123.21	12.9			
75	XBT	85226	1613	38.00	123.29	14.0			
76	CTD	85226	1719	38.08	123.35	14.7	34.31	14.9	34.31
77	XBT	85226	1858	38.17	123.42	13.8			
78	XBT	85226	2024	38.29	123.52	12.0			
79	CTD	85226	2110	38.33	123.55	12.2	34.36	12.9	34.36
80	XBT	85226	2247	38.42	124.03	13.3			
81	XBT	85226	2352	38.52	124.08	13.8			
82	XBT	85227	42	39.00	124.15	12.5			
83	XBT	85227	144	39.09	124.23	12.0			
84	XBT	85227	235	39.17	124.30	11.7			
85	XBT	85227	331	39.25	124.36	15.8			
86	XBT	85227	428	39.34	124.42	15.1			
87	CTD	85227	539	39.42	124.50	14.6	34.33	15.1	34.33
88	XBT	85227	707	39.50	124.55	12.4			
89	XBT	85227	810	39.59	125.02	11.5			
90	XBT	85227	913	40.08	125.10	14.3			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	DEEP SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
91	CTD	85227	1044	40.18	125.17	14.5	34.27	14.5	34.27
92	XBT	85227	1221	40.25	125.25	14.7			
93	XBT	85227	1309	40.34	125.32	13.9			
94	CTD	85227	1418	40.35	125.46	14.4	34.33	14.4	34.34
95	XBT	85227	1553	40.26	125.40	15.6			
96	XBT	85227	1622	40.22	125.38	14.9			
97	XBT	85227	1652	40.17	125.34	15.9			
98	XBT	85227	1724	40.11	125.29	14.6			
99	XBT	85227	1750	40.08	125.27	14.8			
100	XBT	85227	1813	40.04	125.24	13.6			
101	XBT	85227	1822	40.02	125.23	12.9			
102	XBT	85227	1833	40.01	125.22	12.2			
103	XBT	85227	1842	40.00	125.21	11.8			
104	CTD	85227	1927	39.59	125.20	12.0	34.30	12.9	34.30
105	XBT	85227	1957	39.59	125.20	12.1			
106	CTD	85227	2041	40.02	125.22	12.3	*	12.3	*
107	XBT	85227	2133	39.57	125.19	12.1			
108	CTD	85227	2152	39.56	125.18	12.2	*	13.2	*
109	XBT	85227	2238	39.54	125.16	11.9			
110	CTD	85227	2313	39.51	125.14	12.9	*	13.3	*
111	XBT	85228	5	39.47	125.11	14.3			
112	XBT	85228	43	39.41	125.06	14.0			
113	XBT	85228	114	39.34	124.59	12.8			
114	CTD	85228	214	39.28	124.54	12.5	34.34	13.6	34.34
115	XBT	85228	359	39.17	124.47	13.8			
116	XBT	85228	451	39.08	124.38	16.2			
117	CTD	85228	520	39.00	124.32	13.8	34.35	14.3	34.35
118	XBT	85228	750	39.00	124.46	16.2			
119	XBT	85228	903	39.02	125.02	16.4			
120	XBT	85228	1013	39.09	125.08	16.1			
121	XBT	85228	1106	39.17	125.15	16.4			
122	CTD	85228	1250	39.26	125.23	16.1	34.30	16.0	34.29
123	XBT	85228	1418	39.33	125.28	15.6			
124	XBT	85228	1502	39.38	125.33	16.0			
125	XBT	85228	1531	39.43	125.36	15.7			
126	XBT	85228	1539	39.44	125.37	15.8			
127	XBT	85228	1546	39.45	125.38	15.8			
128	XBT	85228	1627	39.51	125.42	15.6			
129	XBT	85228	1647	39.54	125.44	15.8			
130	CTD	85228	1755	39.59	125.50	15.6	34.34	16.0	34.34
131	XBT	85228	1855	40.02	125.52	16.1			
132	XBT	85228	1938	40.08	125.56	16.3			
133	XBT	85228	2013	40.12	125.59	15.5			
134	XBT	85228	2042	40.17	126.03	15.7			
135	XBT	85228	2113	40.21	126.06	16.2			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	DEEP SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
136	XBT	85228	2141	40.25	126.09	16.3			
137	XBT	85228	2213	40.29	126.13	16.0			
138	CTD	85228	2322	40.34	126.17	16.1	34.33	17.1	34.33
139	XBT	85229	106	40.34	126.33	14.9			
140	XBT	85229	214	40.34	126.48	15.2			
141	XBT	85229	306	40.26	126.43	16.4			
142	CTD	85229	410	40.17	126.33	16.6	34.28	17.7	34.28
143	XBT	85229	551	40.08	126.27	16.4			
144	XBT	85229	646	39.59	126.22	16.3			
145	CTD	85229	810	39.51	126.14	16.6	34.31	17.0	34.31
146	XBT	85229	939	39.40	126.07	16.5			
147	XBT	85229	1025	39.33	126.01	16.3			
148	CTD	85229	1142	39.25	125.55	16.4	34.28	16.5	*
149	XBT	85229	1314	39.16	125.46	16.3			
150	XBT	85229	1356	39.09	125.40	16.2			
151	CTD	85229	1506	39.01	125.33	16.3	34.31	16.5	34.31
152	XBT	85229	1652	39.01	125.48	16.2			
153	XBT	85229	1753	39.02	126.01	16.1			
154	XBT	85229	1902	39.09	126.08	16.4			
155	XBT	85229	1958	39.17	126.14	16.2			
156	CTD	85229	2127	39.26	126.22	16.7	34.29	16.6	34.29
157	XBT	85229	2258	39.36	126.29	16.6			
158	XBT	85229	2349	39.43	126.34	16.9			
159	XBT	85230	50	39.52	126.41	17.1			
160	XBT	85230	136	40.00	126.48	16.7			
161	XBT	85230	239	40.09	126.55	16.7			
162	CTD	85230	347	40.17	127.03	16.8	34.31	16.9	34.31
163	XBT	85230	521	40.25	127.09	15.0			
164	CTD	85230	632	40.34	127.16	15.3	34.31	15.8	34.31
165	XBT	85230	818	40.34	127.30	16.1			
166	XBT	85230	922	40.34	127.45	17.3			
167	XBT	85230	1019	40.25	127.39	16.7			
168	CTD	85230	1117	40.17	127.32	16.7	32.29	17.3	34.31
169	XBT	85230	1318	40.07	127.26	16.7			
170	XBT	85230	1406	39.59	127.20	16.6			
171	XBT	85230	1456	39.51	127.13	16.9			
172	XBT	85230	1552	39.43	127.05	16.7			
173	CTD	85230	1643	39.36	126.59	16.7	34.29	16.8	34.29
174	XBT	85230	1825	39.27	126.51	16.4			
175	XBT	85230	1927	39.18	126.44	16.6			
176	XBT	85230	2028	39.09	126.38	16.4			
177	CTD	85230	2132	38.57	126.32	16.4	34.35	16.8	34.35
178	XBT	85230	2327	39.01	126.47	16.4			
179	XBT	85231	31	39.01	127.02	16.5			
180	XBT	85231	143	39.10	127.11	16.6			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	DEEP SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
181	XBT	85231	223	39.17	127.15	17.0			
182	CTD	85231	334	39.27	127.22	17.2	34.32	17.6	34.32
183	XBT	85231	513	39.35	127.28	17.1			
184	XBT	85231	603	39.43	127.36	17.4			
185	XBT	85231	709	39.52	127.41	17.2			
186	CTD	85231	759	39.59	127.49	17.1	34.30	17.2	34.30
187	XBT	85231	944	40.08	127.56	17.2			
188	XBT	85231	1048	40.17	128.03	17.5			
189	XBT	85231	1152	40.26	128.11	17.2			
190	CTD	85231	1303	40.34	128.17	17.3	34.30	17.8	34.30
191	XBT	85231	1447	40.35	128.30	16.9			
192	XBT	85231	1542	40.34	128.46	16.9			
193	XBT	85231	1644	40.25	128.39	16.9			
194	XBT	85231	1741	40.16	128.32	17.5			
195	CTD	85231	1908	40.08	128.25	17.5	34.31	17.7	34.31
196	XBT	85231	2053	39.59	128.17	17.3			
197	XBT	85231	2147	39.52	128.12	16.9			
198	XBT	85231	2311	39.42	128.03	17.1			
199	CTD	85232	11	39.37	127.59	17.1	34.32	17.2	34.33
200	XBT	85232	152	39.27	127.53	17.1			
201	XBT	85232	251	39.18	127.46	17.0			
202	XBT	85232	347	39.09	127.39	17.2			
203	CTD	85232	455	39.01	127.31	17.0	34.31	17.2	34.31
204	XBT	85232	631	38.51	127.26	16.8			
205	XBT	85232	722	38.44	127.19	16.4			
206	XBT	85232	821	38.33	127.11	15.5			
207	XBT	85232	907	38.26	127.06	15.4			
208	XBT	85232	1019	38.15	126.58	15.7			
209	XBT	85232	1109	38.08	126.52	15.7			
210	XBT	85232	1206	38.00	126.45	15.7			
211	XBT	85232	1302	37.50	126.38	16.9			
212	XBT	85232	1353	37.43	126.32	16.7			
213	CTD	85232	1515	37.33	126.23	16.6	34.36	16.8	34.36
214	XBT	85232	1725	37.44	126.22	16.7			
215	XBT	85232	1813	37.52	126.22	16.5			
216	XBT	85232	1933	38.03	126.22	16.7			
217	XBT	85232	2035	38.12	126.21	16.6			
218	XBT	85232	2142	38.22	126.20	16.0			
219	XBT	85232	2241	38.32	126.22	15.8			
220	CTD	85233	13	38.44	126.24	16.4	34.35	16.5	34.36
221	XBT	85233	202	38.33	126.16	16.5			
222	XBT	85233	253	38.27	126.09	16.4			
223	XBT	85233	402	38.17	126.02	16.1			
224	XBT	85233	500	38.09	125.55	15.8			
225	XBT	85233	603	37.59	125.47	15.9			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	DEEP SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
226	XBT	85233	703	37.51	125.40	16.5			
227	XBT	85233	759	37.42	125.33	16.9			
228	CTD	85233	904	37.32	125.26	16.8	34.36	16.7	34.35
229	XBT	85233	1110	37.42	125.27	16.8			
230	XBT	85233	1223	37.52	125.28	16.6			
231	XBT	85233	1344	38.03	125.27	15.1			
232	XBT	85233	1356	38.05	125.27	14.9			
233	XBT	85233	1426	38.09	125.28	14.8			
234	CTD	85233	1505	38.12	125.29	14.8	34.38	14.9	34.38
235	XBT	85233	1652	38.17	125.29	15.9			
236	XBT	85233	1725	38.22	125.30	16.2			
237	XBT	85233	1816	38.28	125.29	16.3			
238	XBT	85233	1928	38.19	125.24	15.4			
239	XBT	85233	1958	38.14	125.21	15.1			
240	XBT	85233	2022	38.10	125.18	14.3			
241	XBT	85233	2047	38.06	125.16	14.3			
242	XBT	85233	2114	38.03	125.13	15.6			
243	XBT	85233	2152	37.57	125.09	14.8			
244	XBT	85233	2216	37.54	125.06	15.7			
245	XBT	85233	2319	37.45	124.59	14.9			
246	XBT	85234	7	37.38	124.52	15.0			
247	XBT	85234	43	37.32	124.47	13.3			
248	XBT	85234	111	37.32	124.41	14.9			
249	XBT	85234	147	37.32	124.34	14.9			
250	XBT	85234	243	37.31	124.23	16.9			
251	XBT	85234	339	37.32	124.11	16.7			
252	XBT	85234	451	37.31	123.58	14.1			
253	XBT	85234	607	37.32	123.45	14.1			
254	XBT	85234	727	37.32	123.32	15.0			
255	XBT	85234	835	37.33	123.21	15.2			
256	XBT	85234	947	37.34	123.08	15.7			
257	XBT	85234	1039	37.34	123.00	14.1			

* Data not available

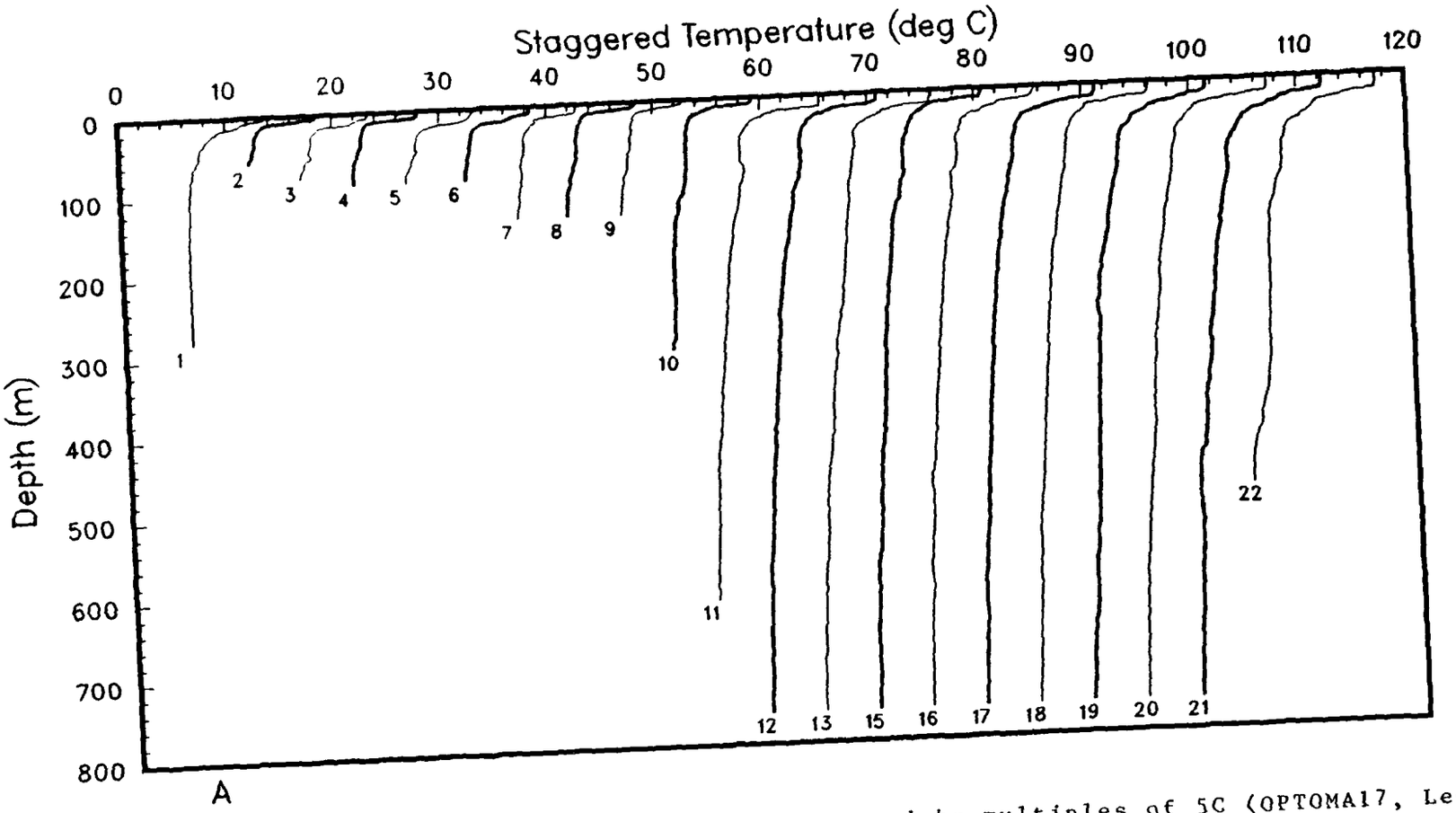


Figure 11(a): XBT temperature profiles, staggered by multiples of 5C (OPTOMA17, Leg DI).

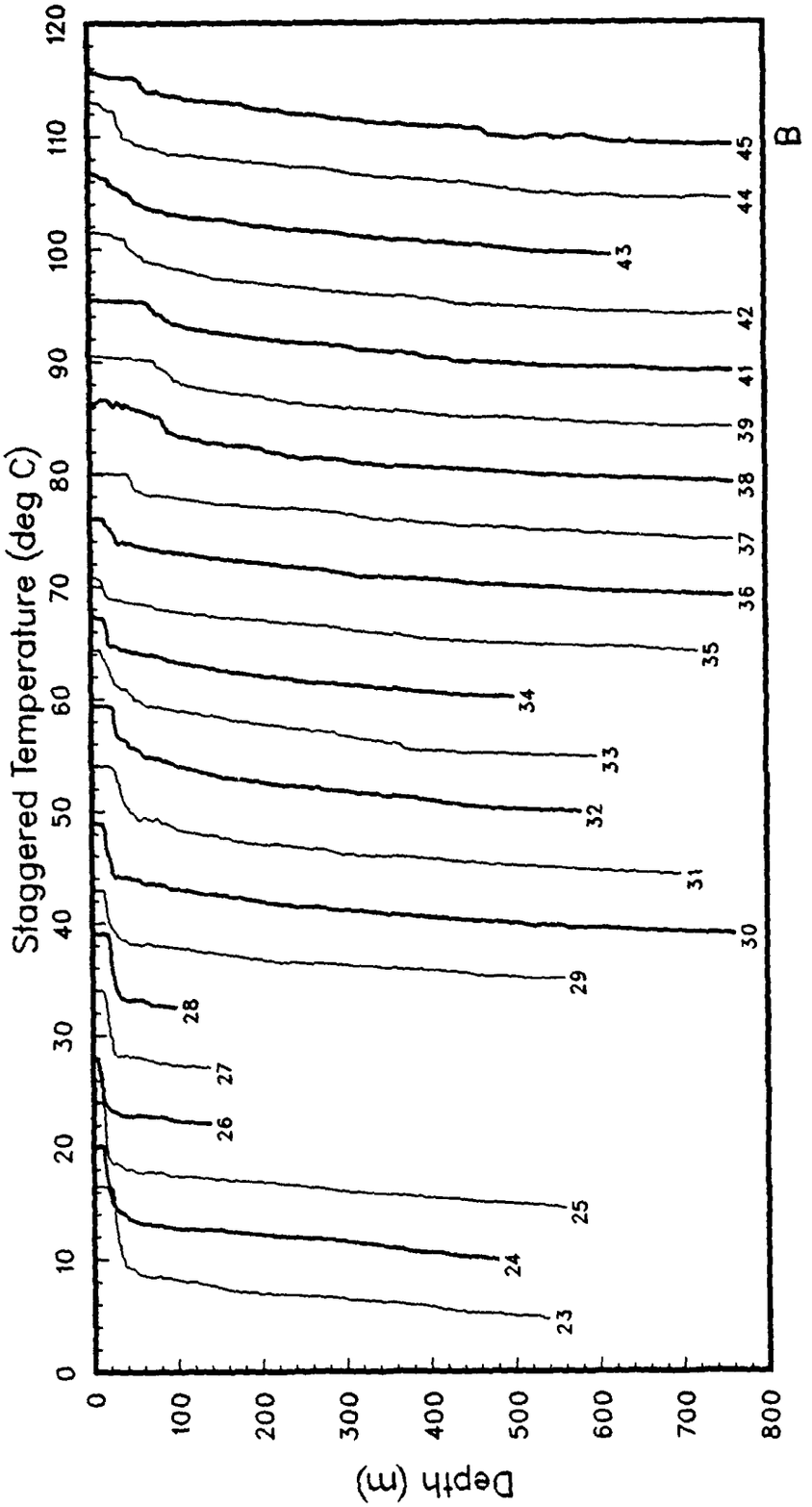

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
41
42
43
44
45
B

Figure 11(b)

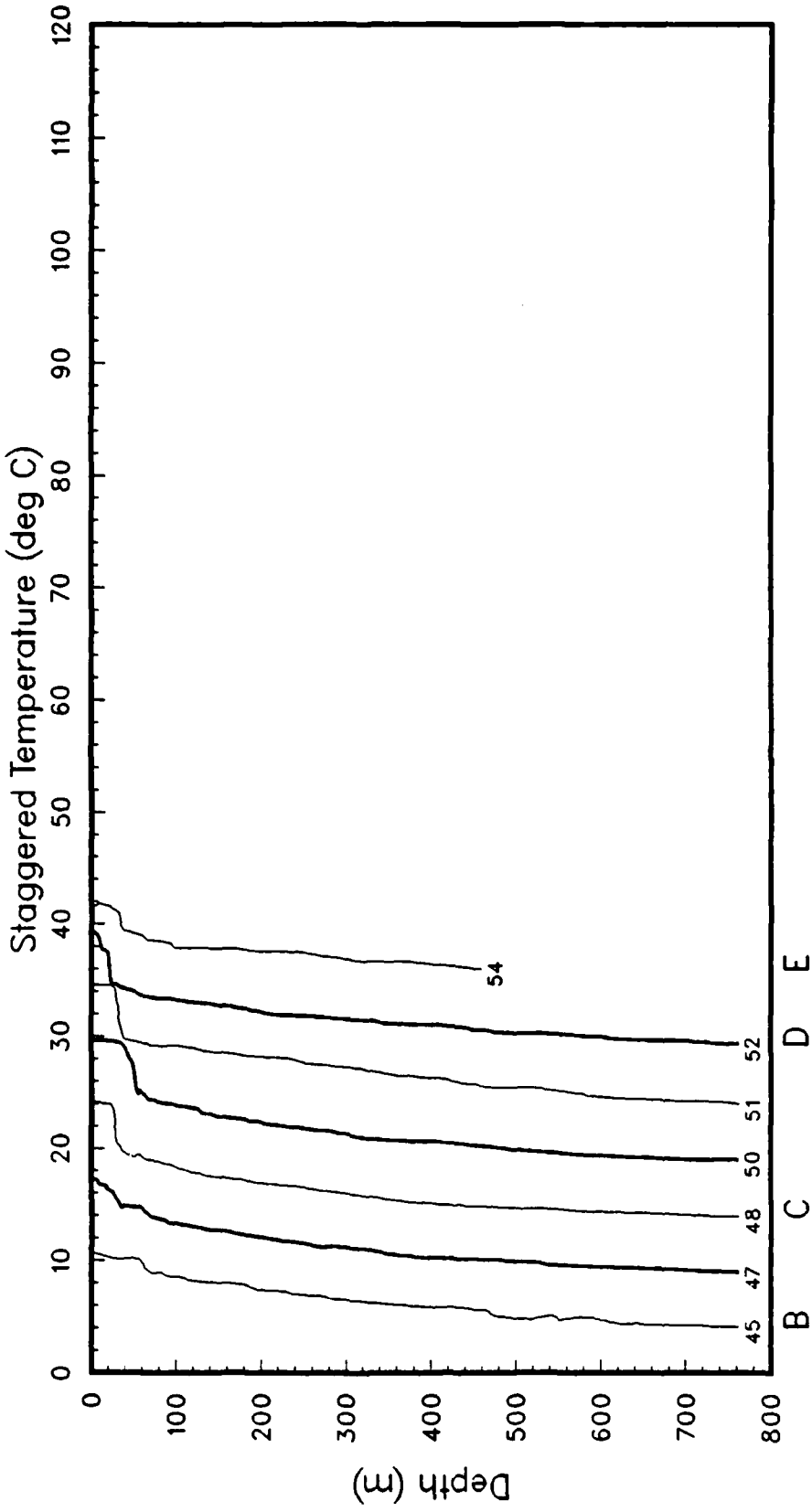

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
45
47
48
50
51
52
54
B
C
D
E

Figure 11(c)

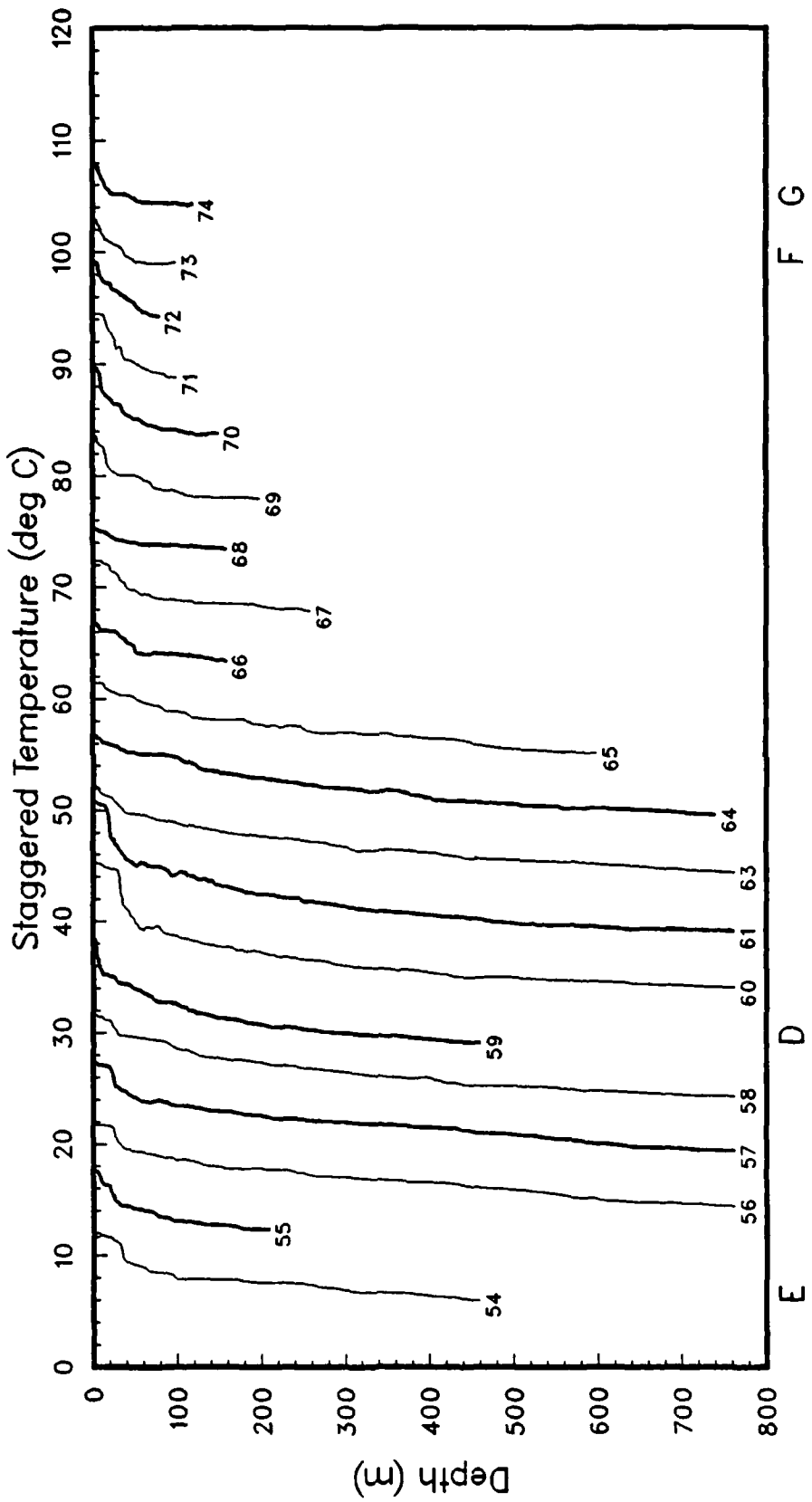

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
54
55
56
57
58
59
60
61
63
64
65
66
67
68
69
70
71
72
73
74
E
D
F
G

Figure 11(d)

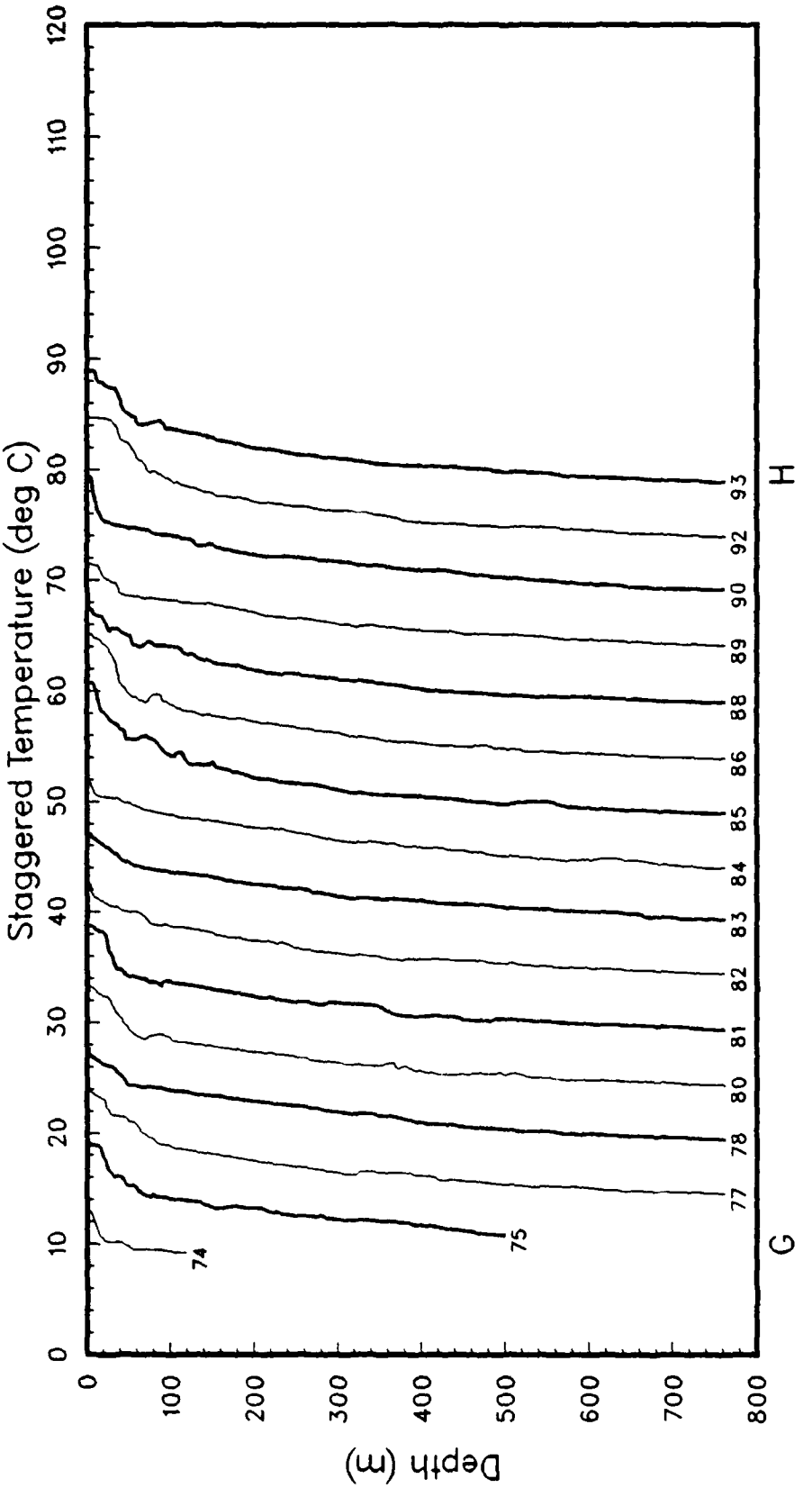

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
74
75
77
78
80
81
82
83
84
85
86
88
89
90
92
93
G
H

Figure 11(e)

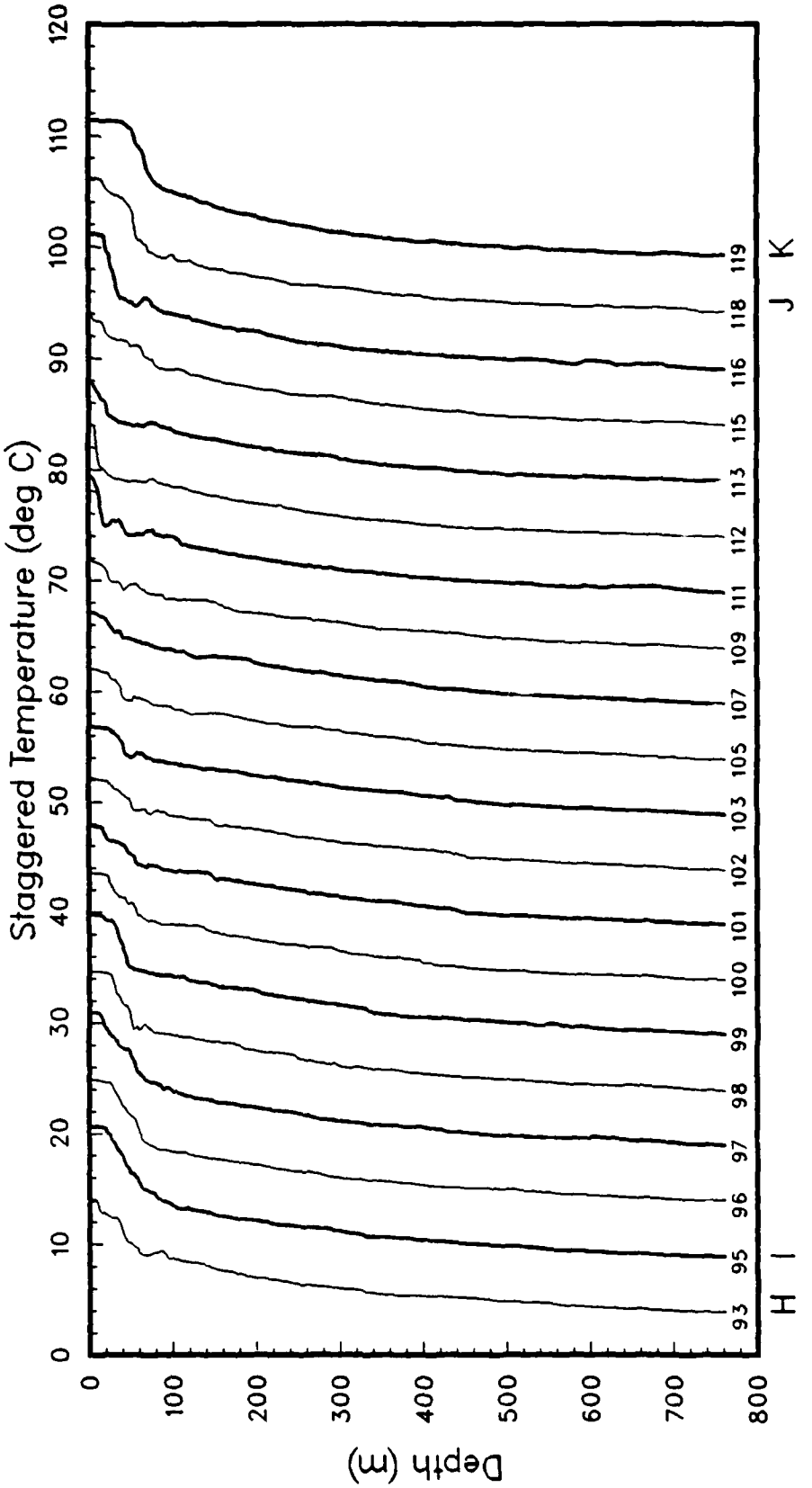

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
H I
93
95
96
97
98
99
100
101
102
103
105
107
109
111
112
113
115
116
118
119
J K

Figure 11(f)

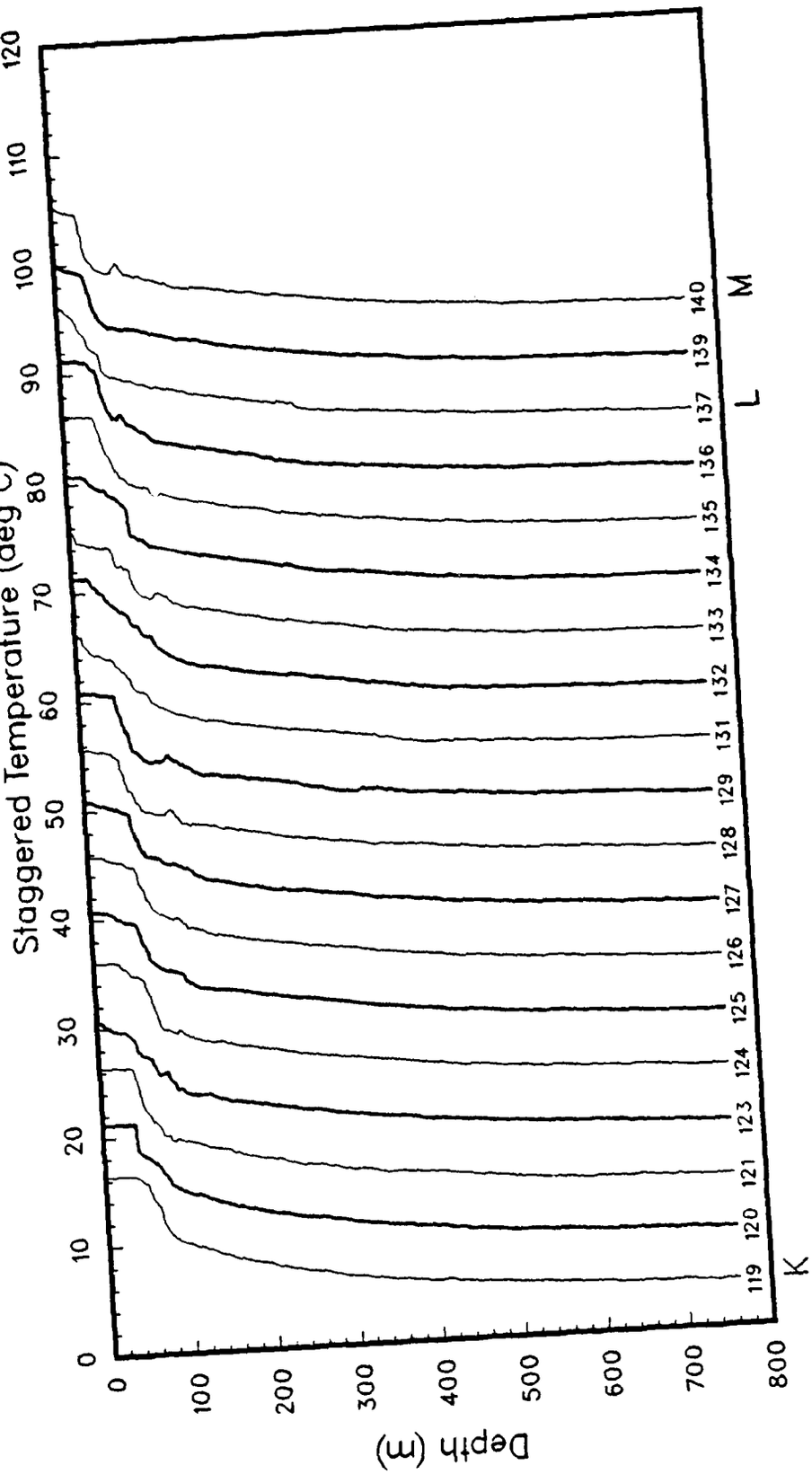

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
119
120
121
123
124
125
126
127
128
129
131
132
133
134
135
136
137
139
140
K
L
M

Figure 11(g)

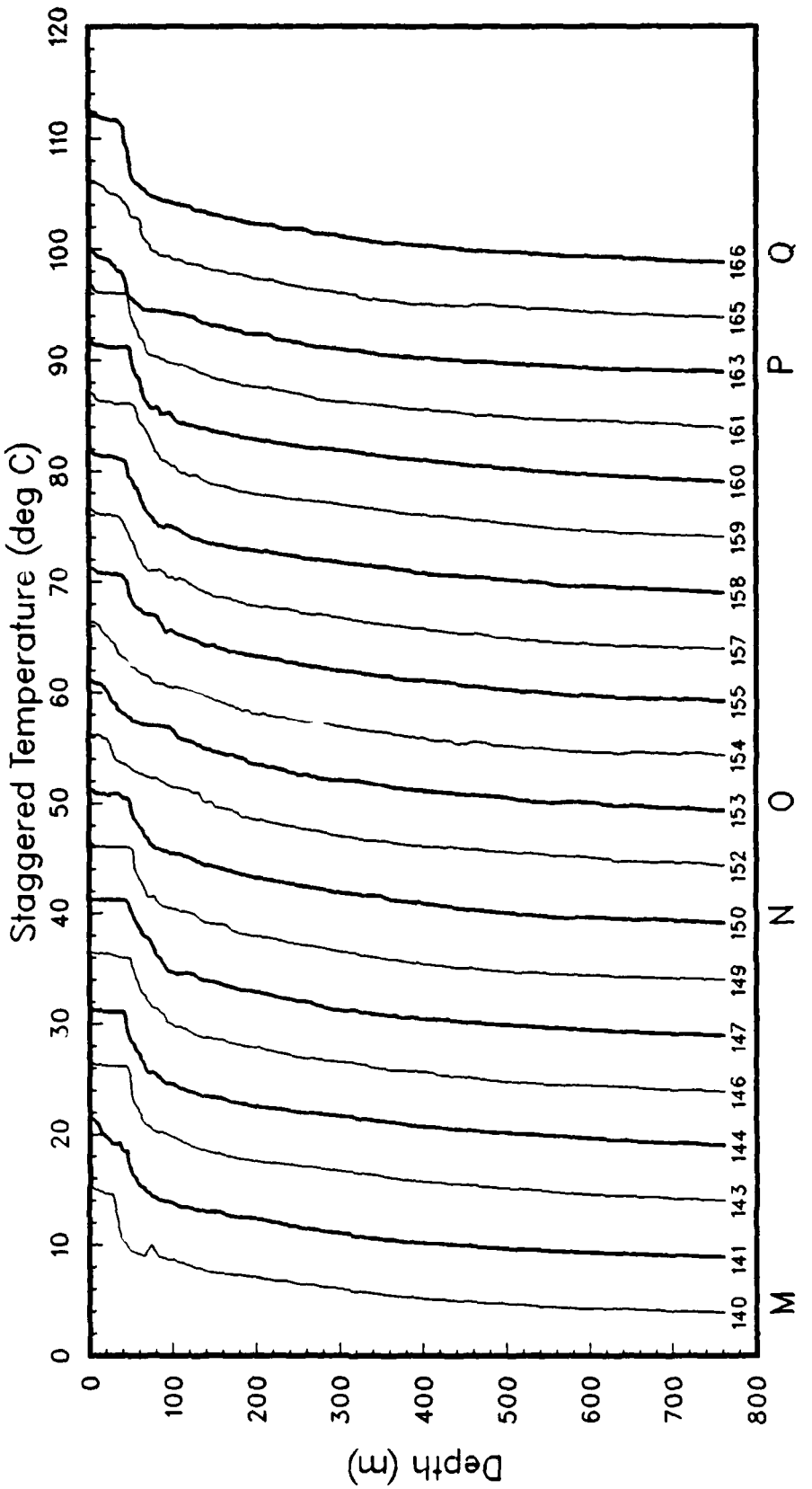

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
140
141
143
144
146
147
149
150
152
153
154
155
157
158
159
160
161
163
165
166
M
N
O
P
Q

Figure 11(h)

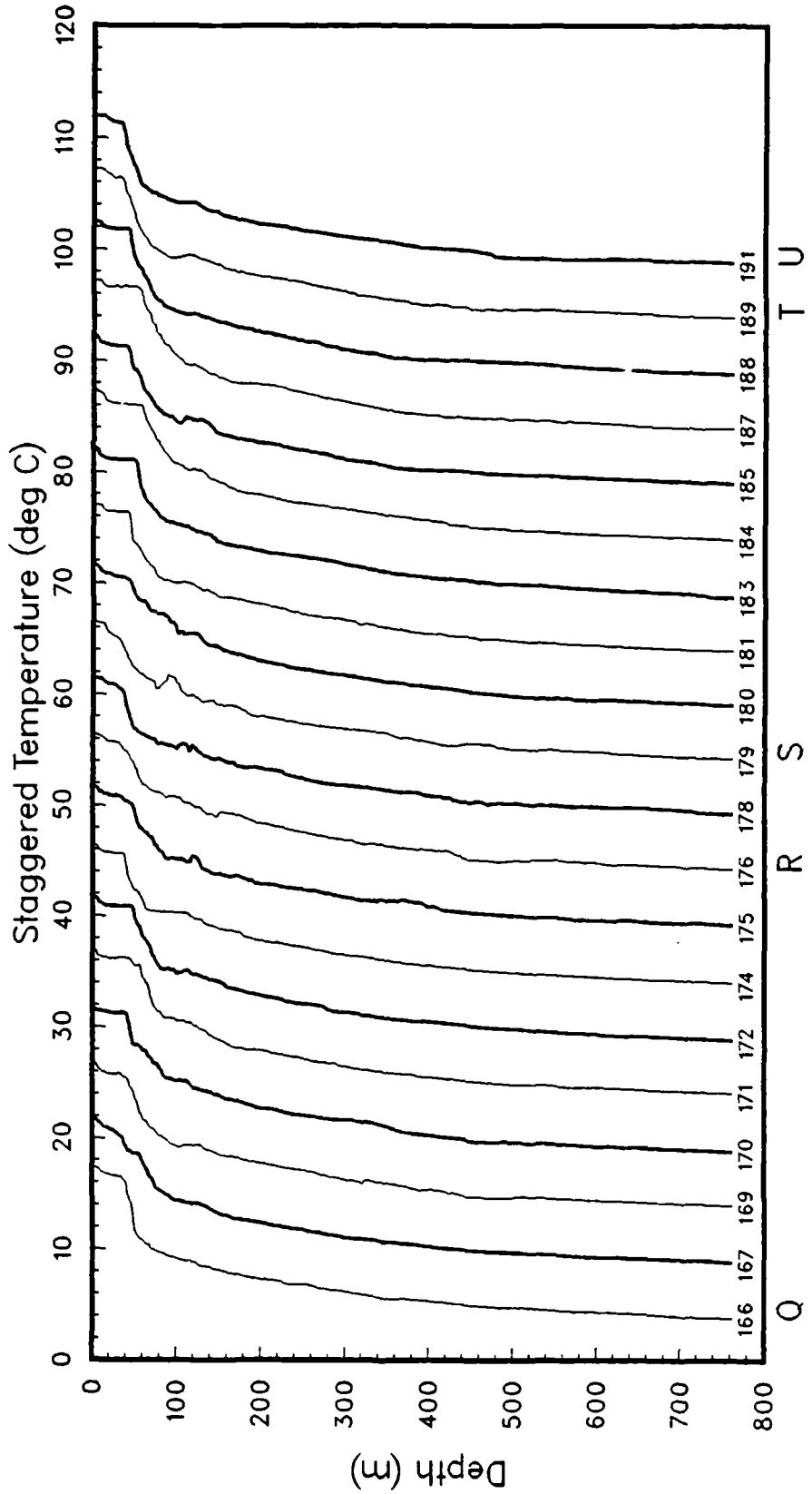

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
166
167
169
170
171
172
174
175
176
178
179
180
181
183
184
185
187
188
189
191
Q
R
S
T
U

Figure 11(i)

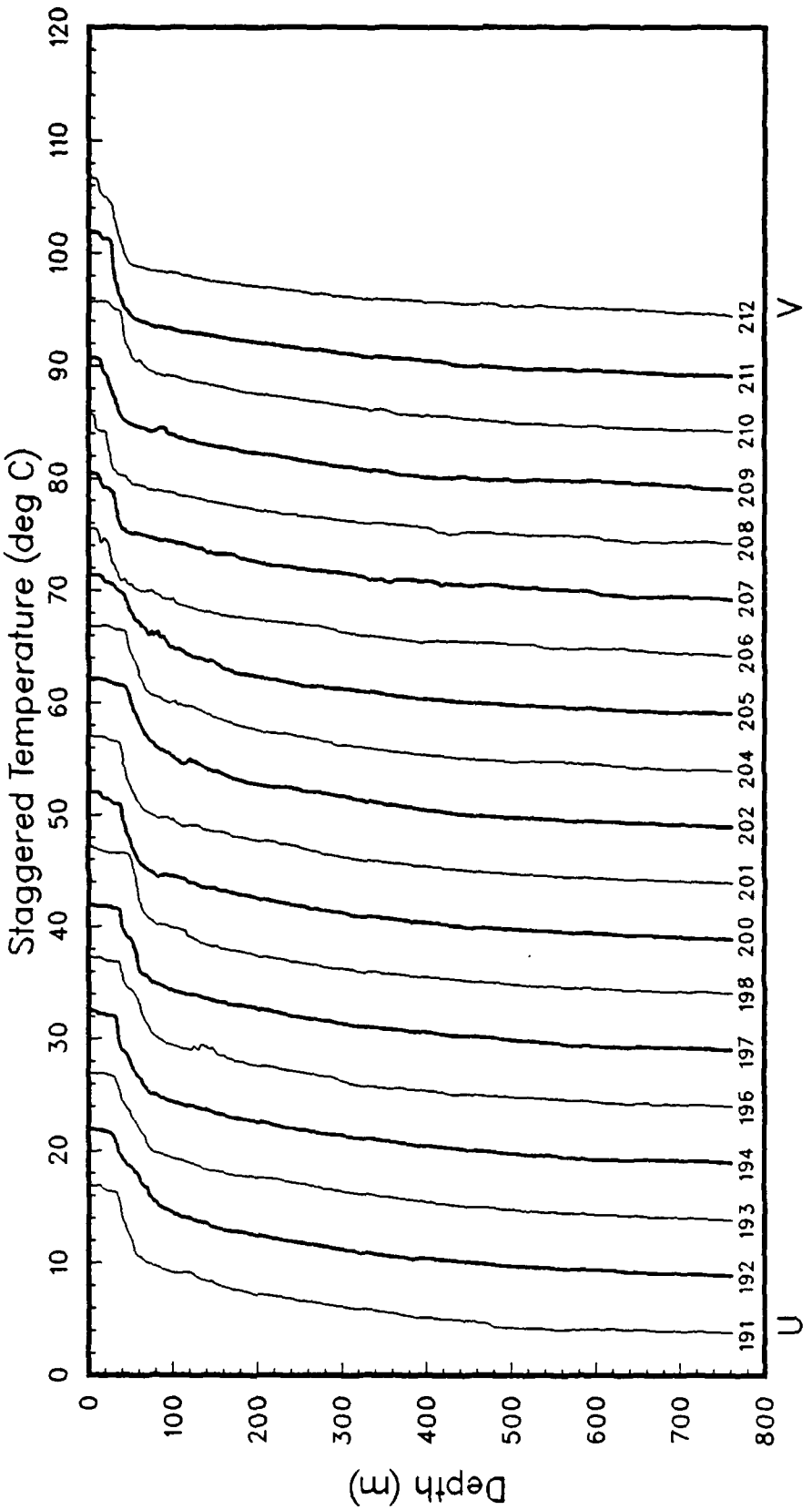

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
191
192
193
194
196
197
198
200
201
202
204
205
206
207
208
209
210
211
212
U
V

Figure 11(j)

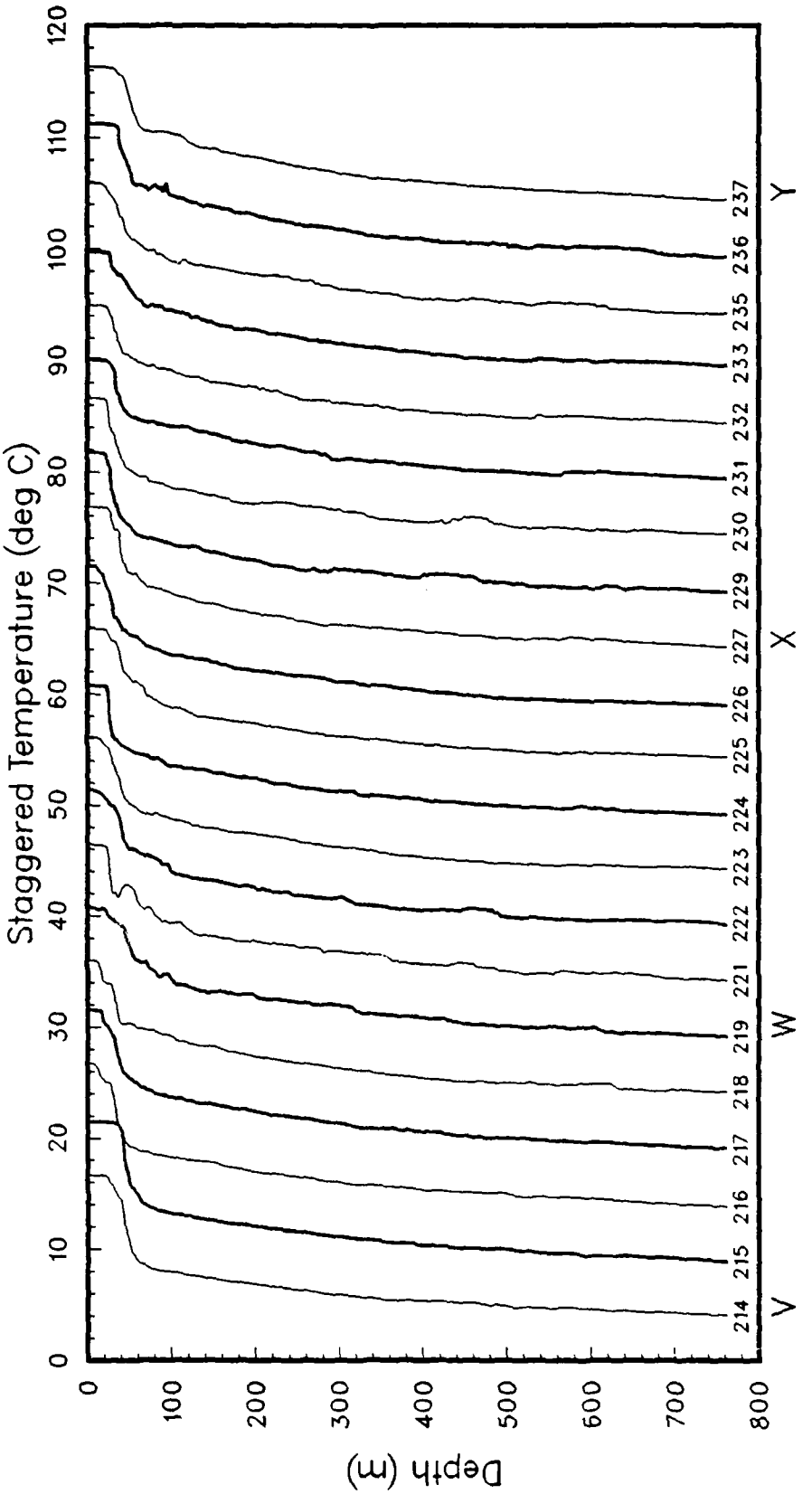

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
214 215 216 217 218 219 221 222 223 224 225 226 227 229 230 231 232 233 235 236 237
V
W
X
Y

Figure 11(k)

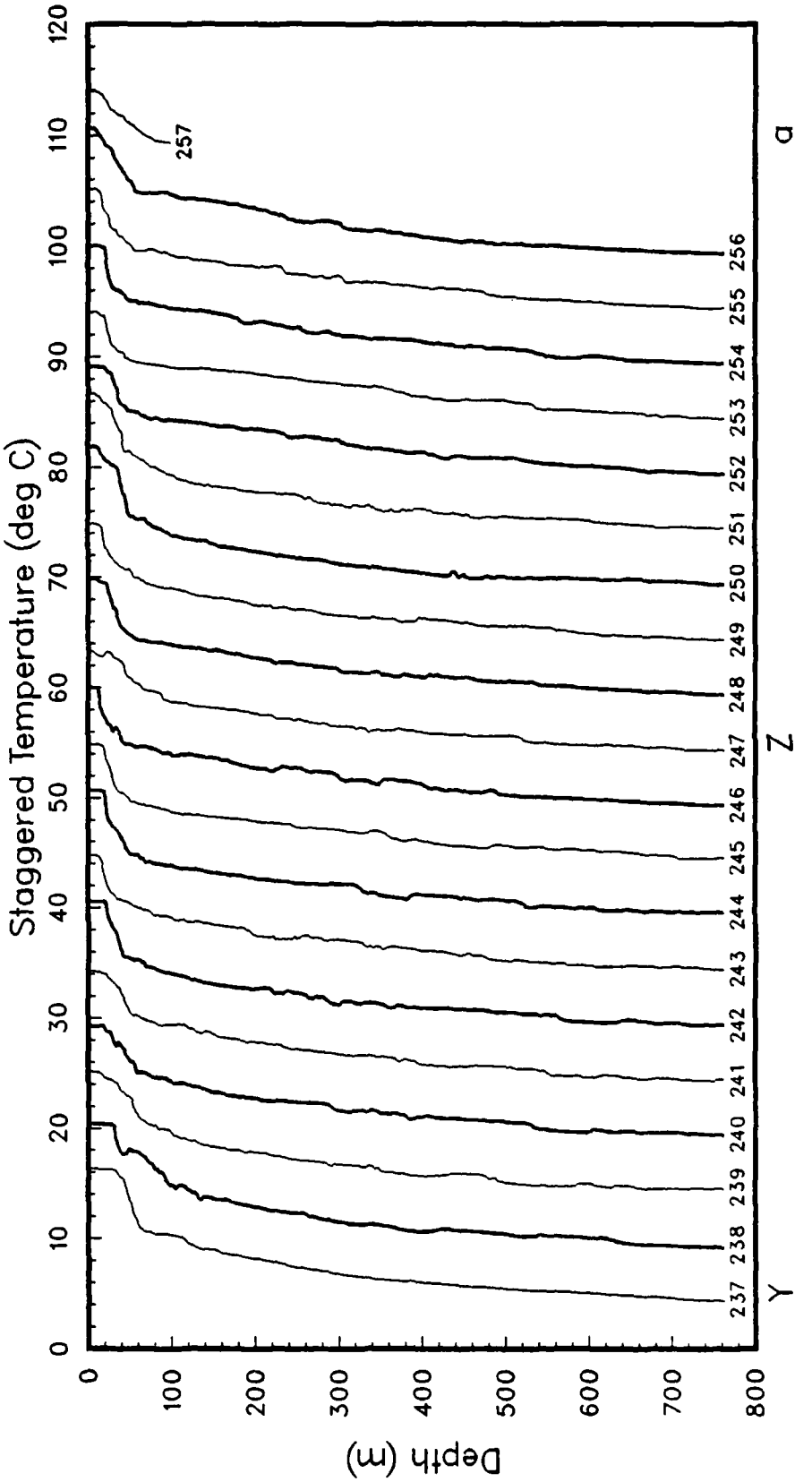

Staggered Temperature (deg C)
Depth (m)
0
10
20
30
40
50
60
70
80
90
100
110
120
0
100
200
300
400
500
600
700
800
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
Y
Z
a

Figure 11(1)

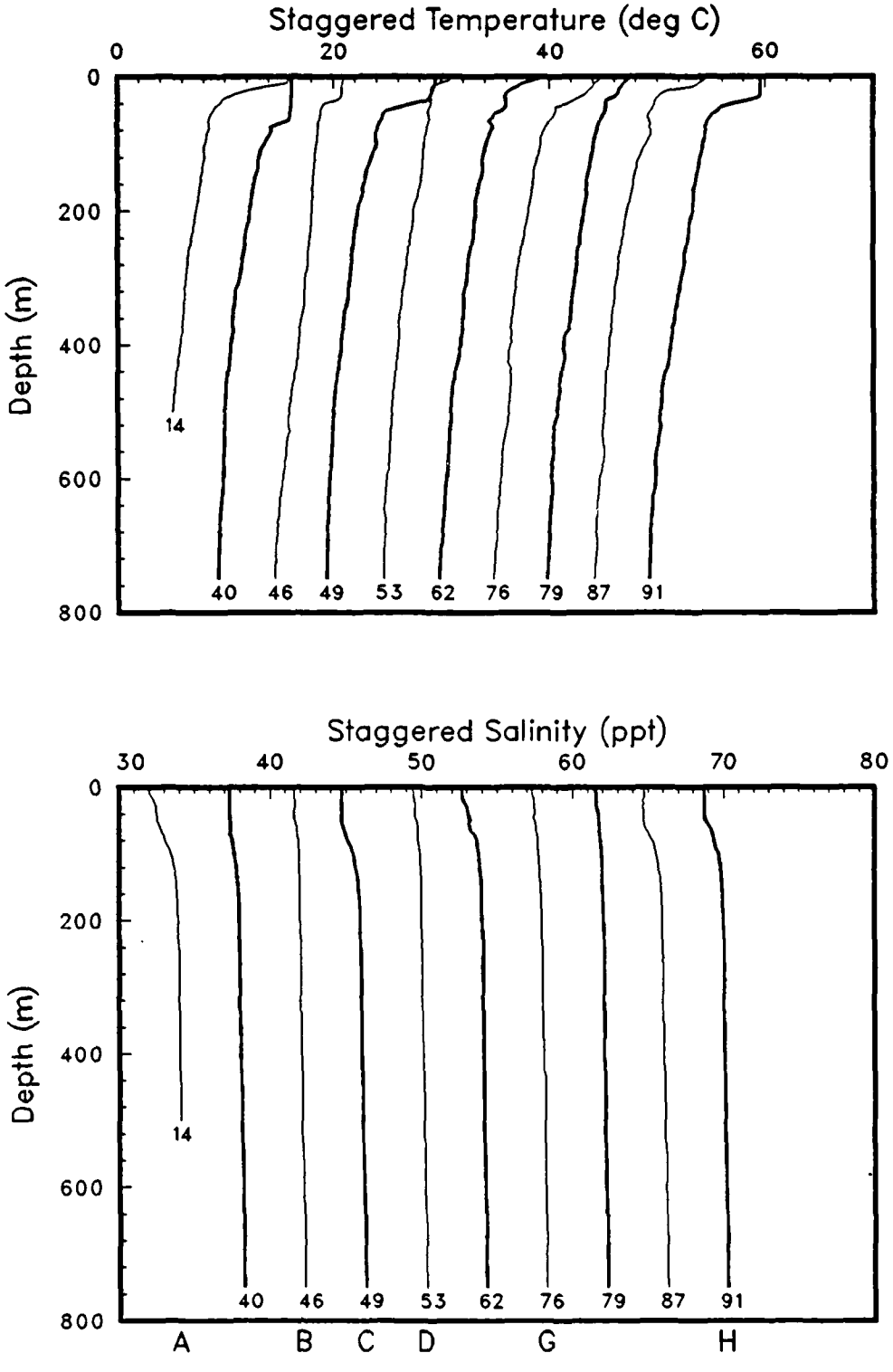


Figure 12(a): CTD temperature profiles, staggered by multiples of 5C, and salinity profiles staggered by multiples of 4 ppt (OPTOMA17, Leg DI).

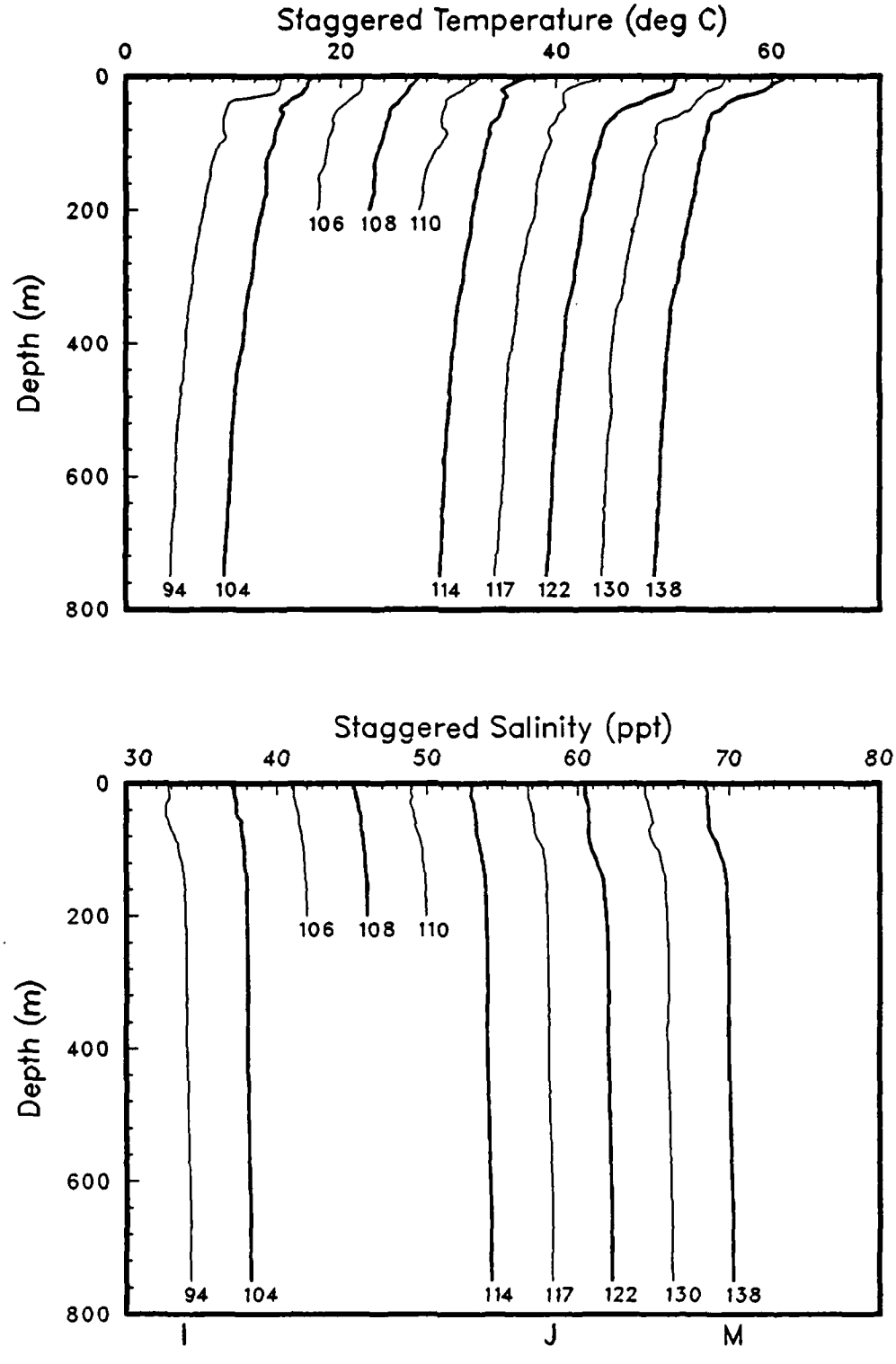

Staggered Temperature (deg C)
0
20
40
60
0
200
400
600
800
Depth (m)
106
108
110
94
104
114
117
122
130
138
Staggered Salinity (ppt)
30
40
50
60
70
80
0
200
400
600
800
Depth (m)
106
108
110
94
104
114
117
122
130
138
I
J
M

Figure 12(b)

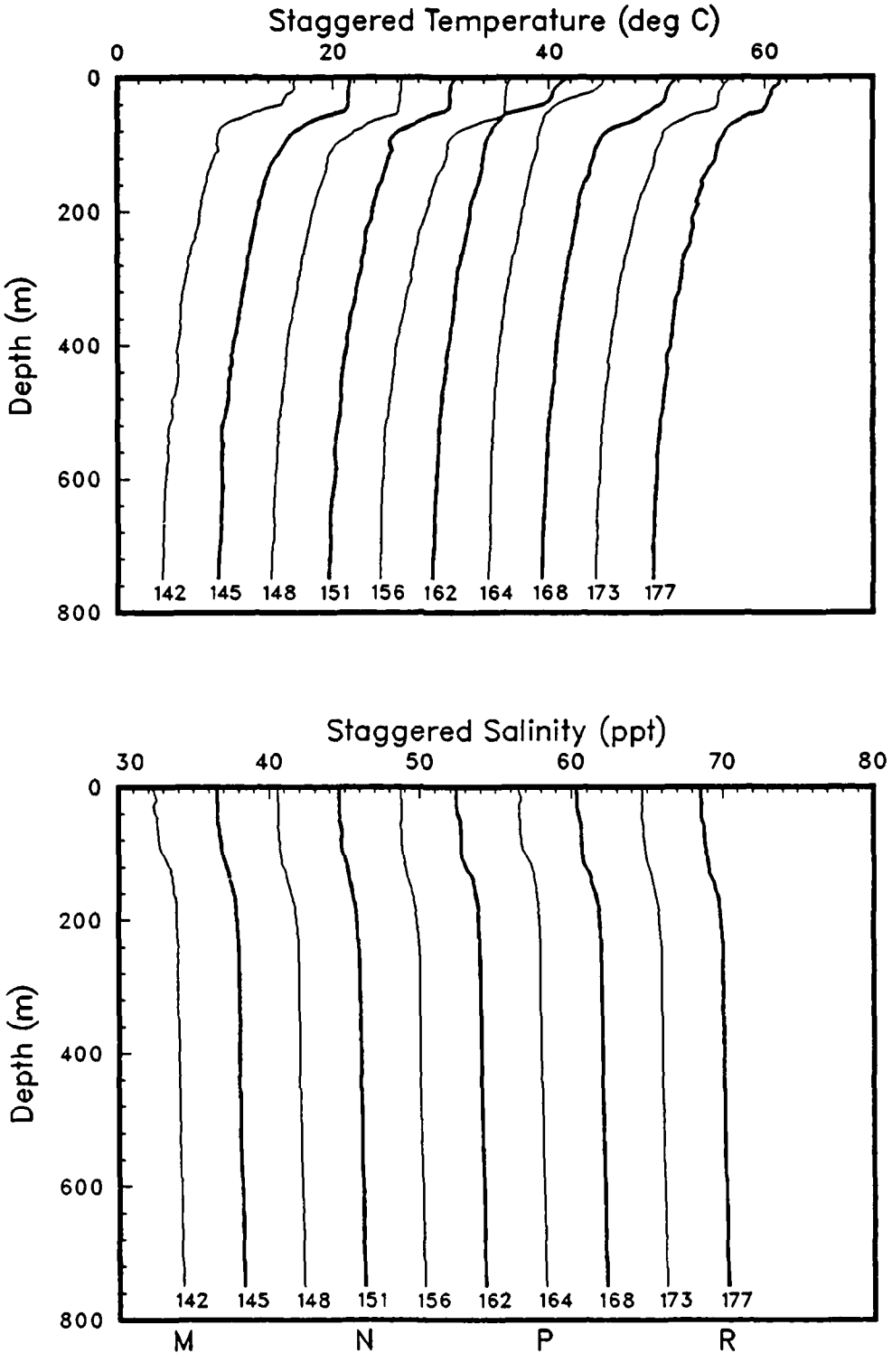

Staggered Temperature (deg C)
0
20
40
60
Depth (m)
0
200
400
600
800
142
145
148
151
156
162
164
168
173
177
Staggered Salinity (ppt)
30
40
50
60
70
80
0
200
400
600
800
142
145
148
151
156
162
164
168
173
177
M
N
P
R

Figure 12(c)

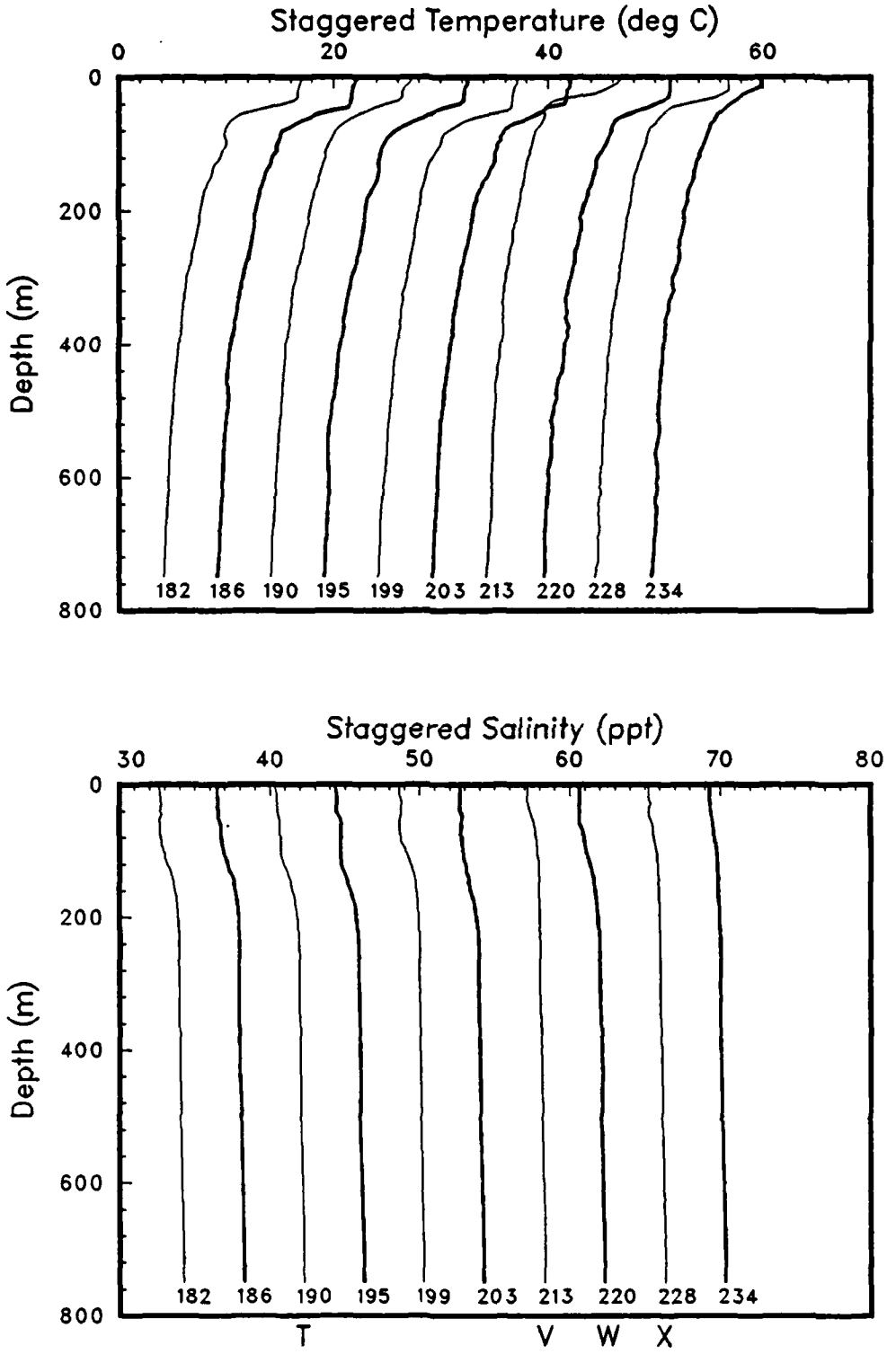

Staggered Temperature (deg C)
0
20
40
60
Depth (m)
0
200
400
600
800
182 186 190 195 199 203 213 220 228 234
Staggered Salinity (ppt)
30
40
50
60
70
80
Depth (m)
0
200
400
600
800
182 186 190 195 199 203 213 220 228 234
T
V
W
X

Figure 12(d)

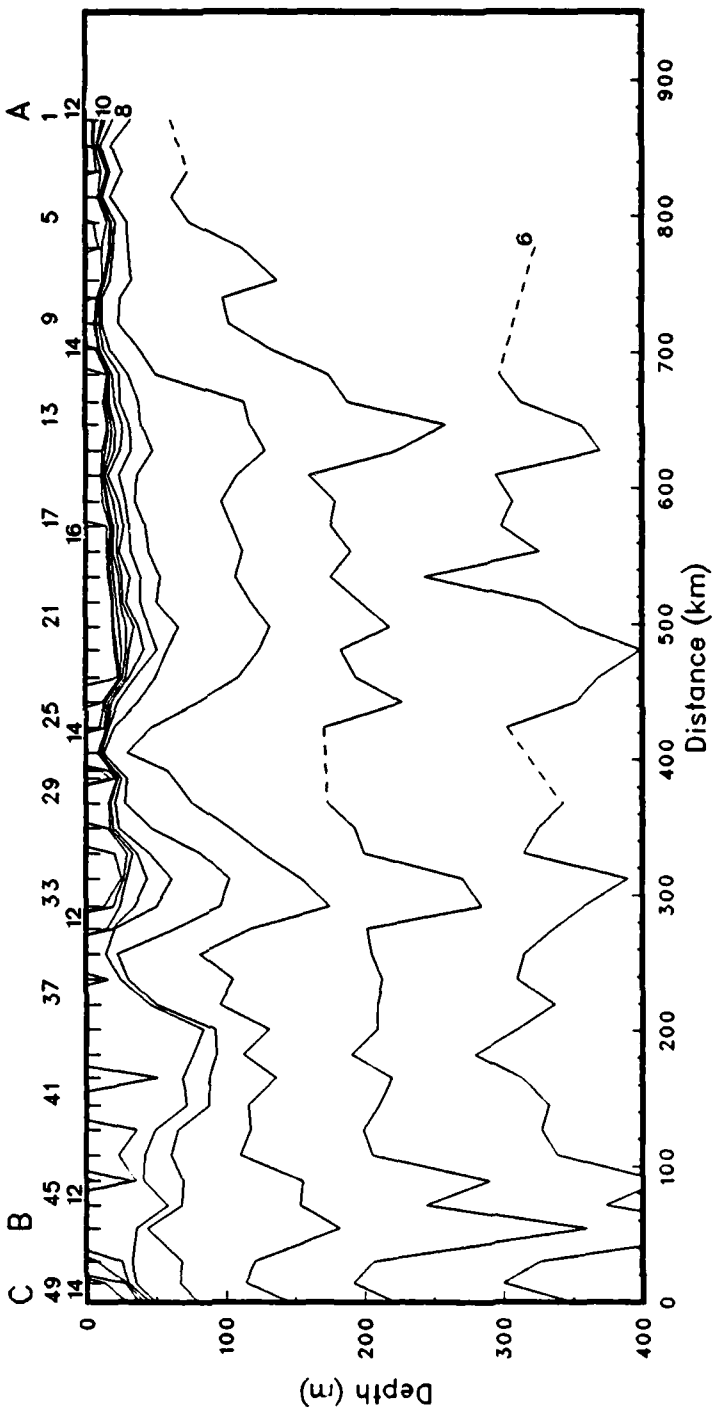


Figure 13(a): Along-track isotherms. Tick marks along the upper horizontal axis show station positions. Some station numbers are given. Dashed lines are used if the cast was too shallow (OPTOMA17, Leg DI).

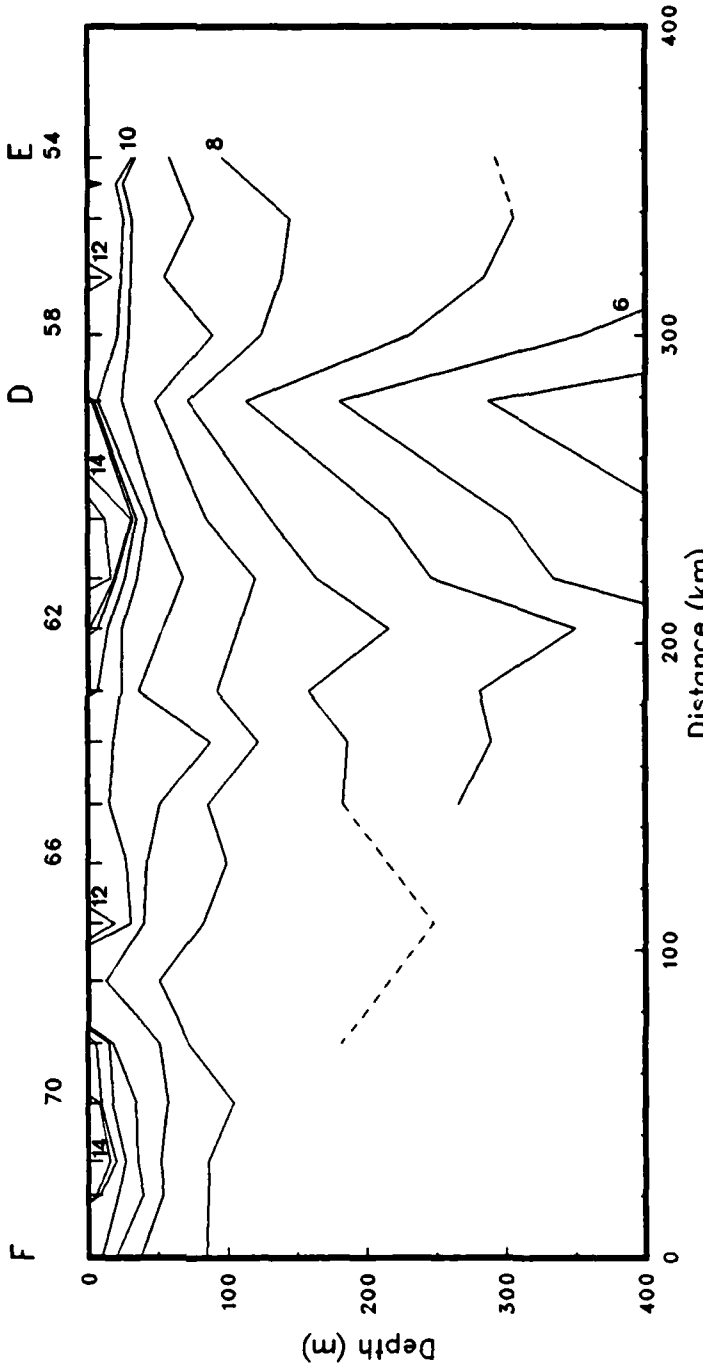

F
70
66
62
D
58
E
54
14
12
10
8
6
0
100
200
300
400
Depth (m)
Distance (km)

Figure 13(b)

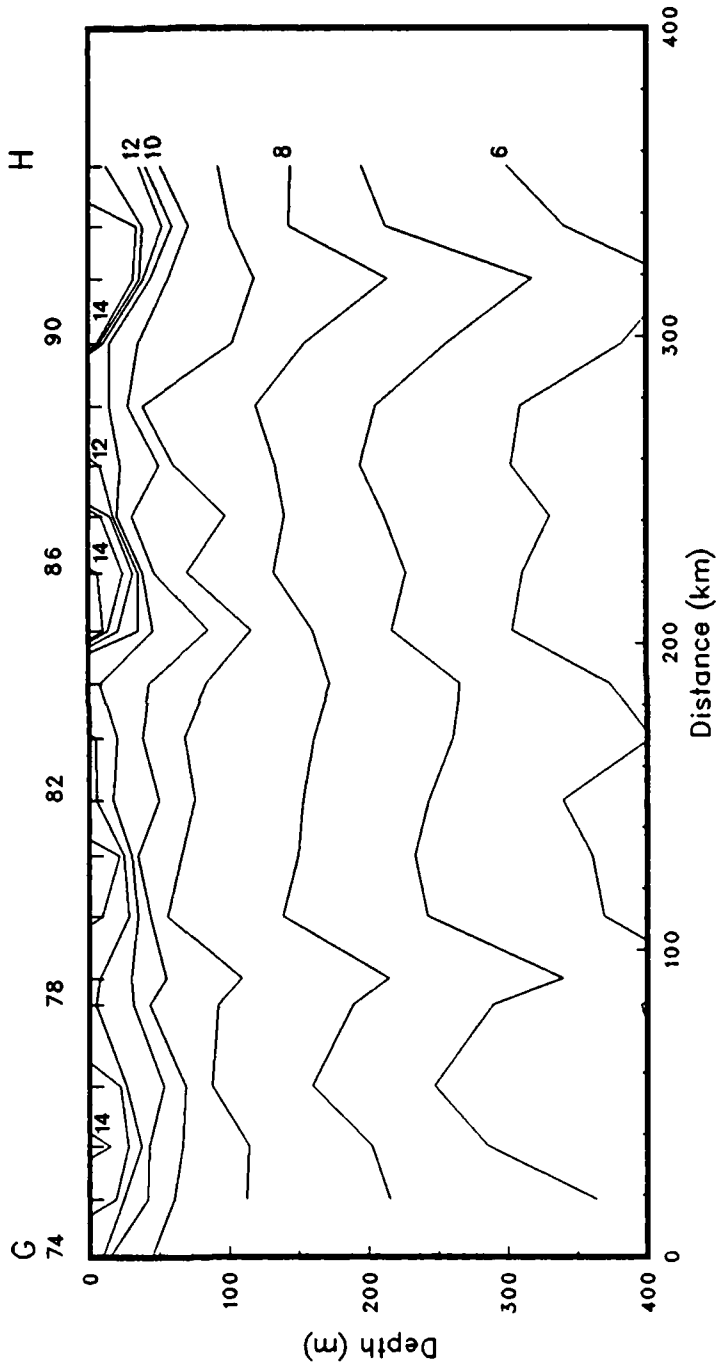


Figure 13(c)

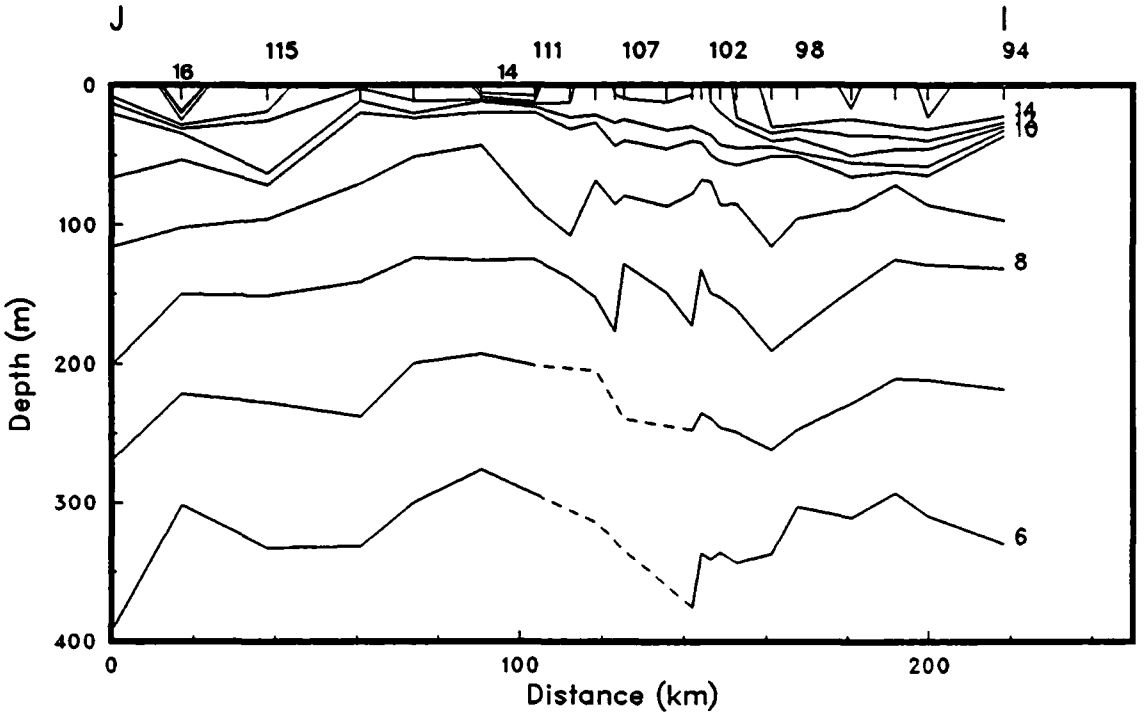


Figure 13(d)

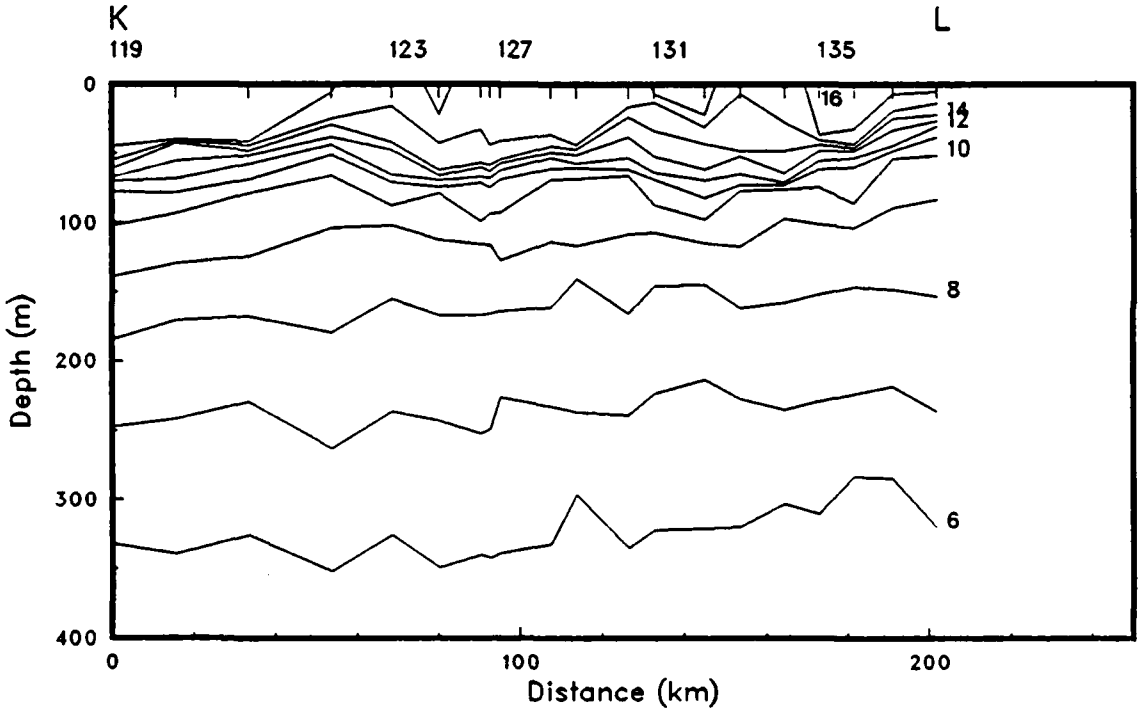


Figure 13(e)

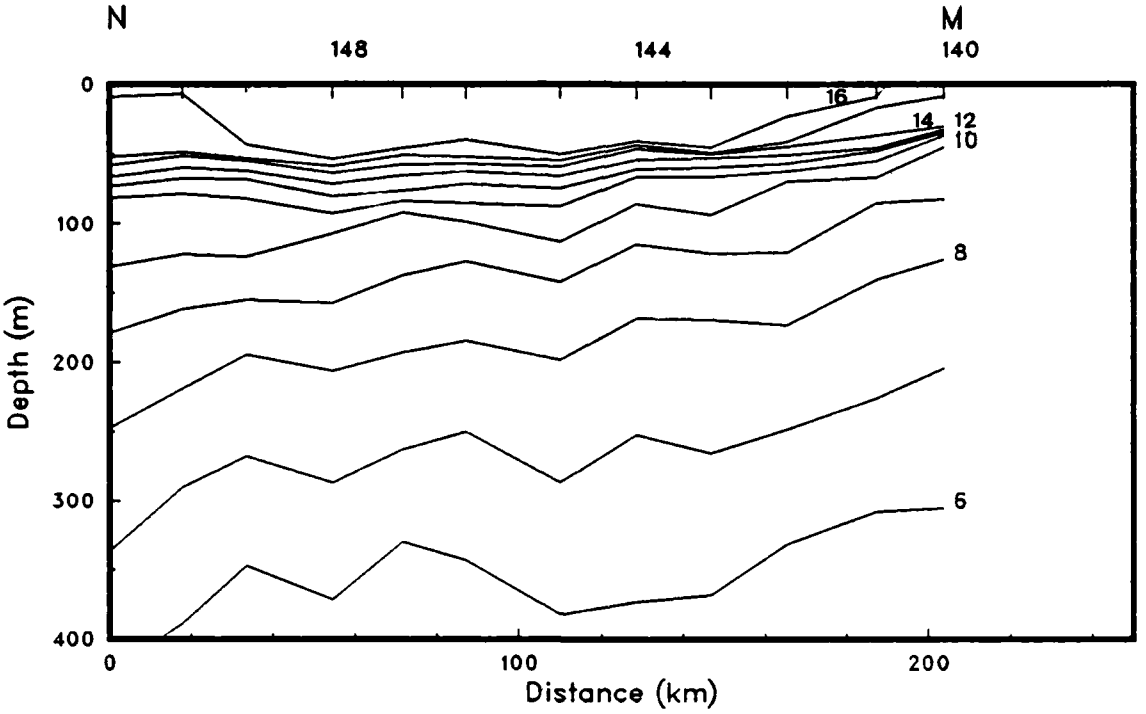


Figure 13(f)

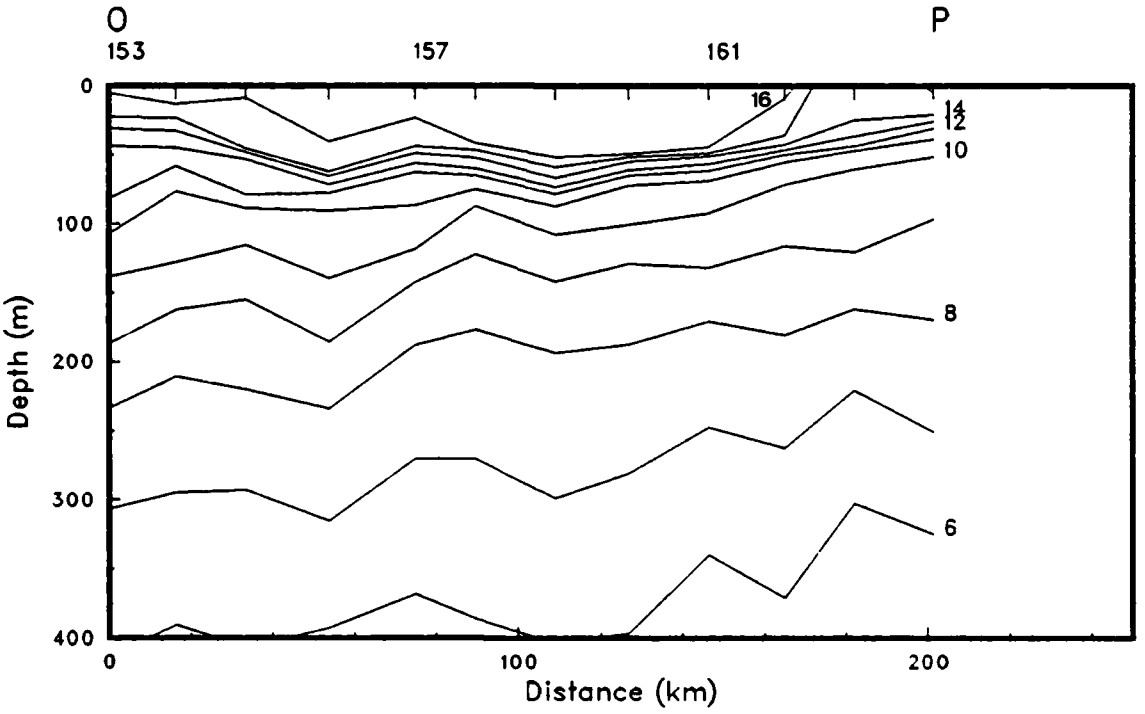


Figure 13(g)

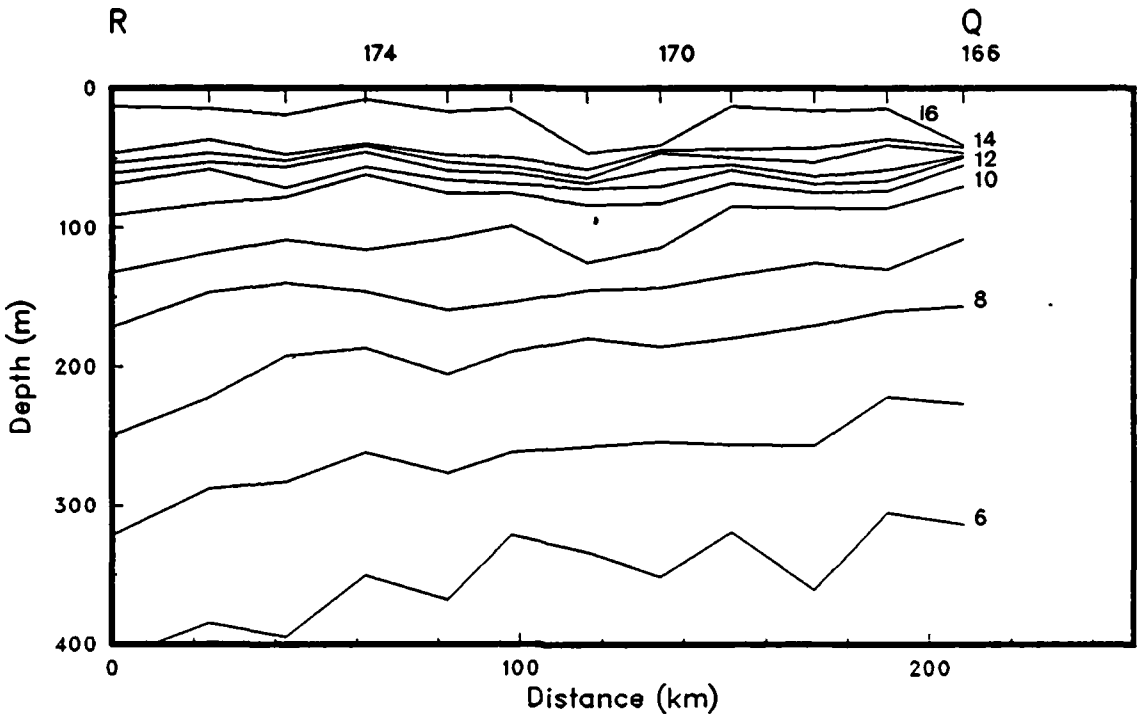


Figure 13(h)

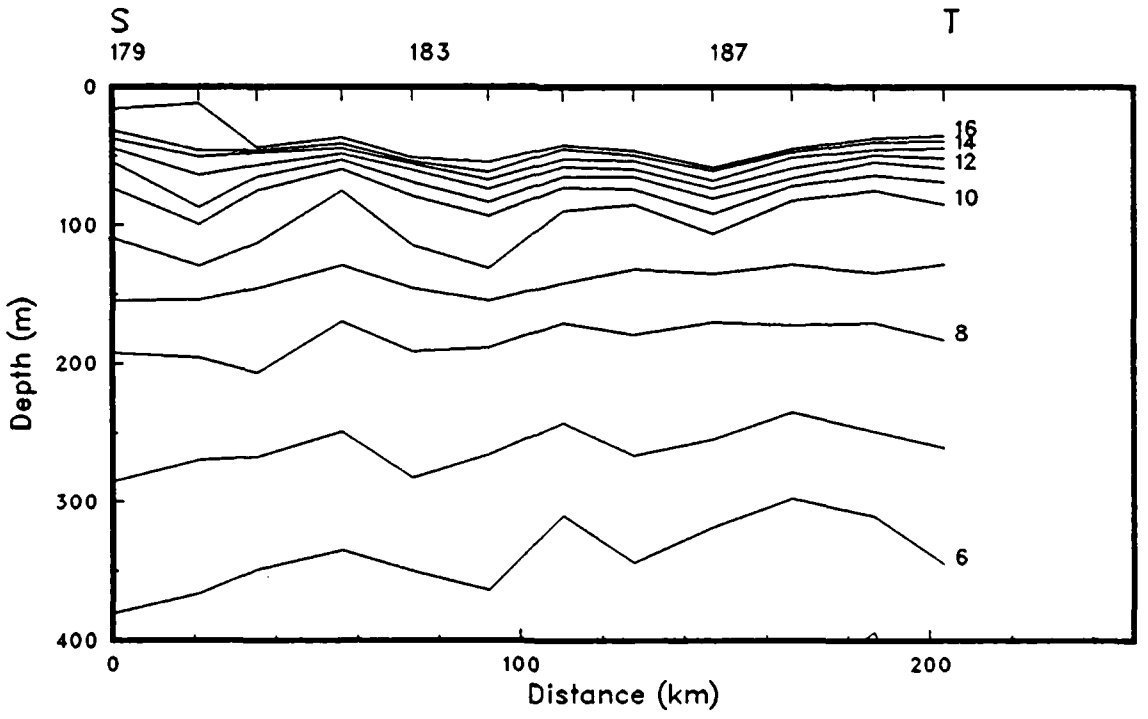


Figure 13(i)

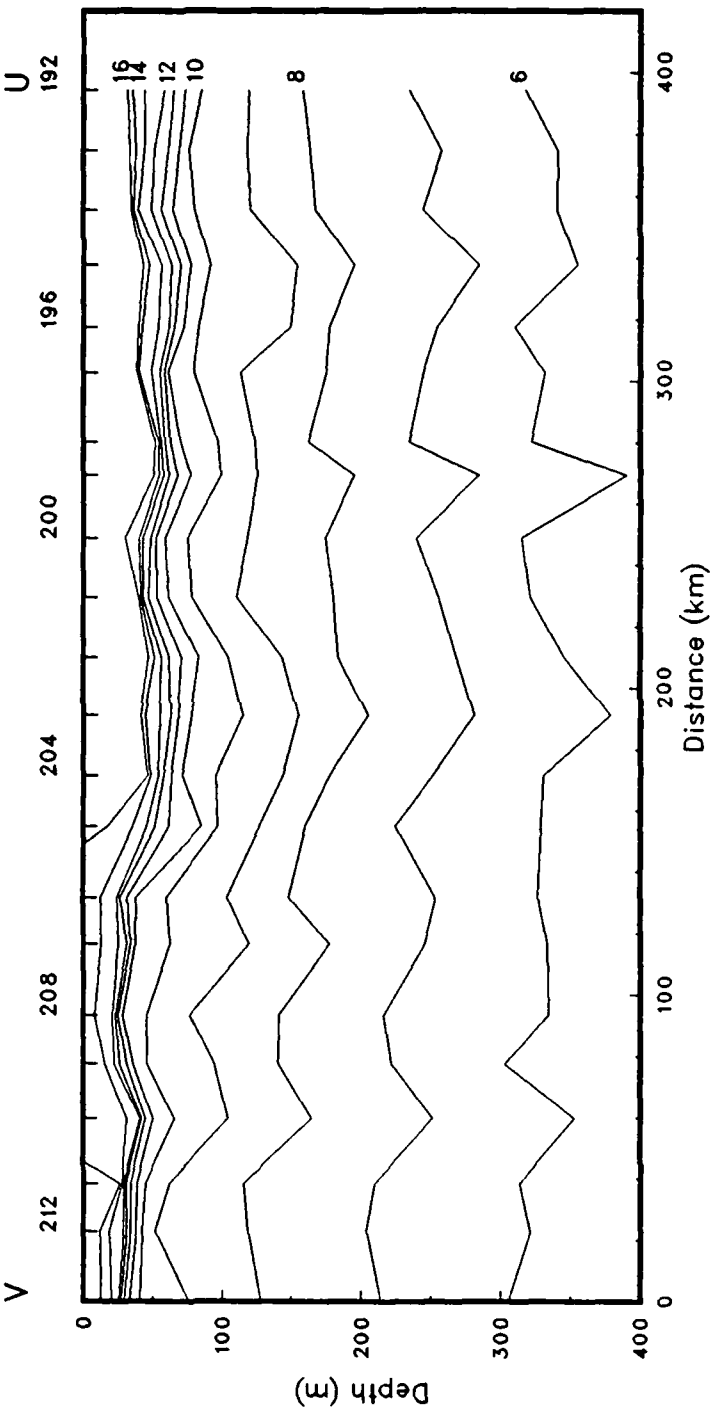

U
192
196
200
204
208
212
V
16
14
12
10
8
6
0
100
200
300
400
Depth (m)
0
100
200
300
400
Distance (km)

Figure 13(j)

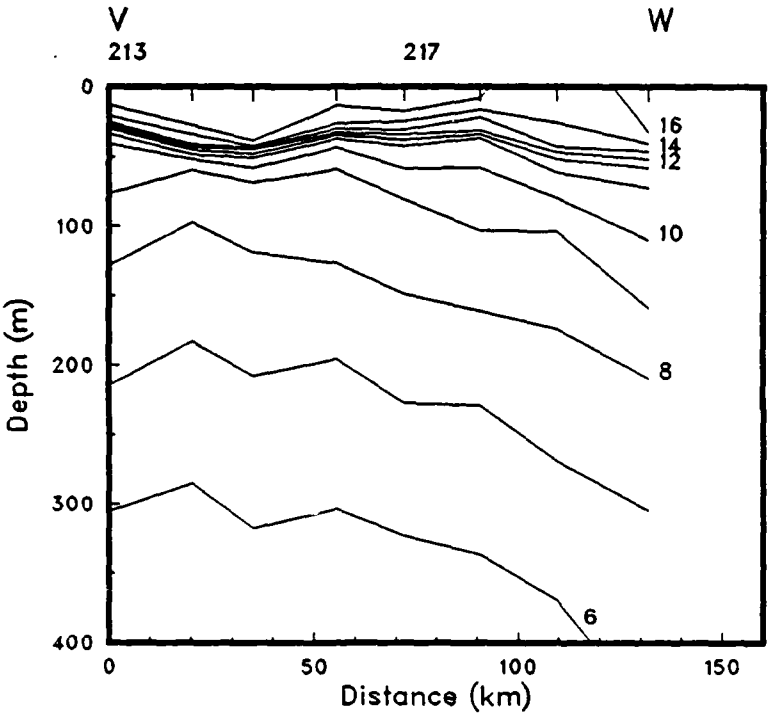


Figure 13(k)

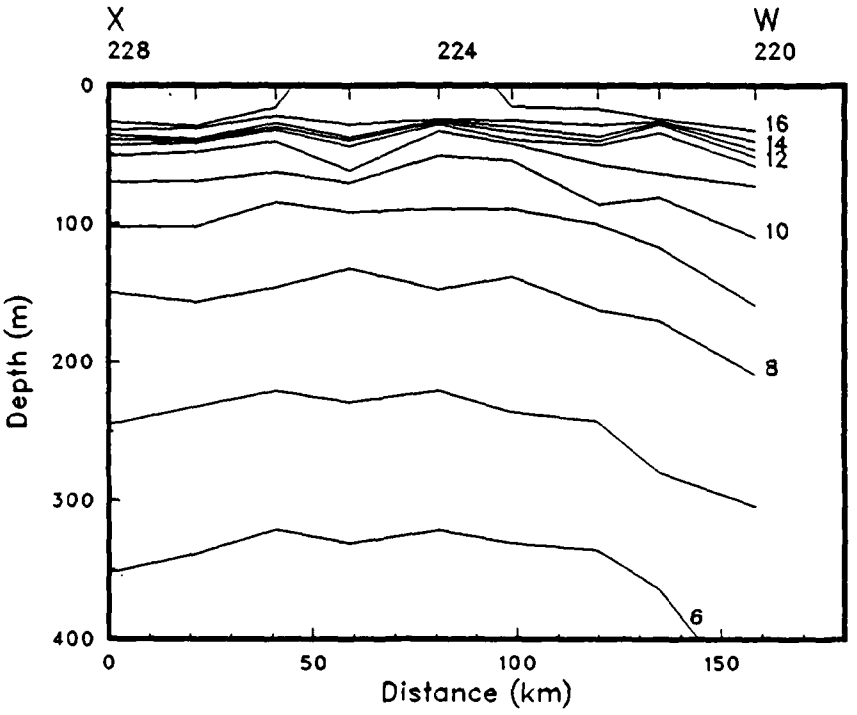


Figure 13(l)

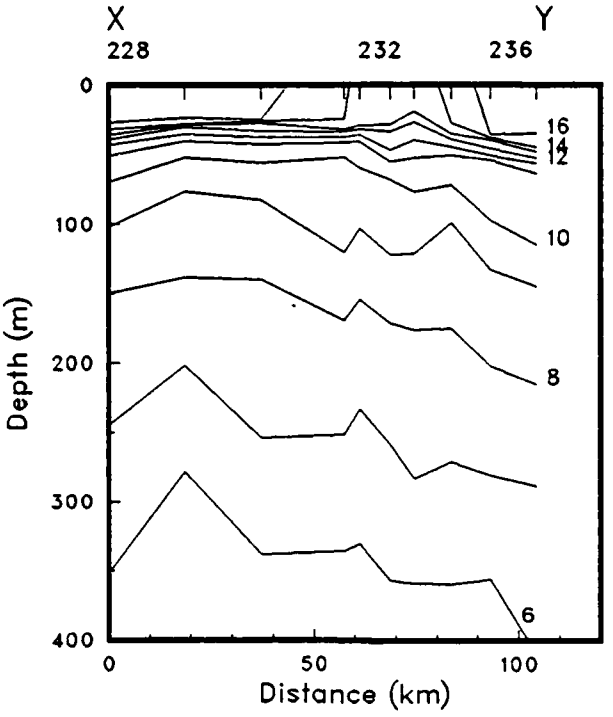


Figure 13(m)

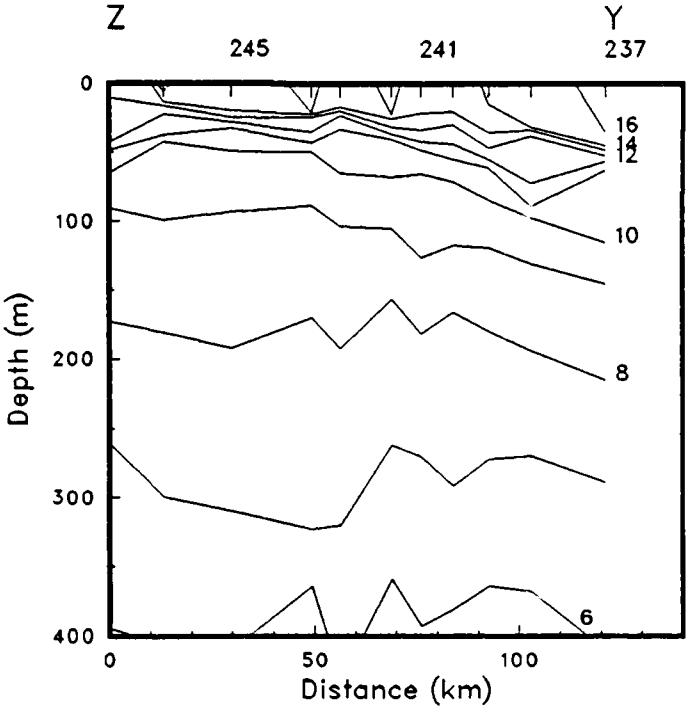


Figure 13(n)

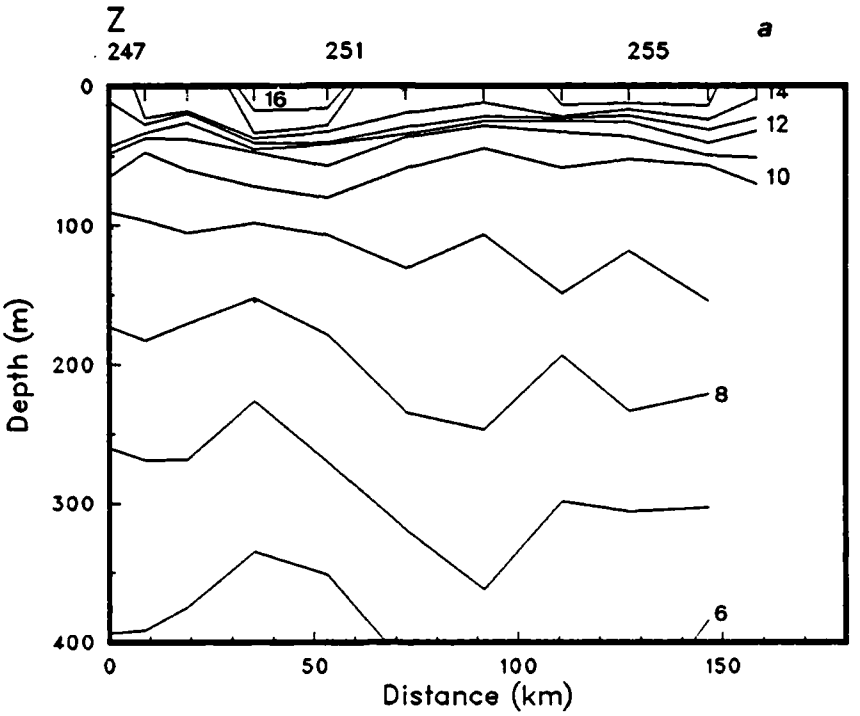

Z
247
251
255
a
0
100
200
300
400
Depth (m)
16
14
12
10
8
6
0
50
100
150
Distance (km)

Figure 13(o)

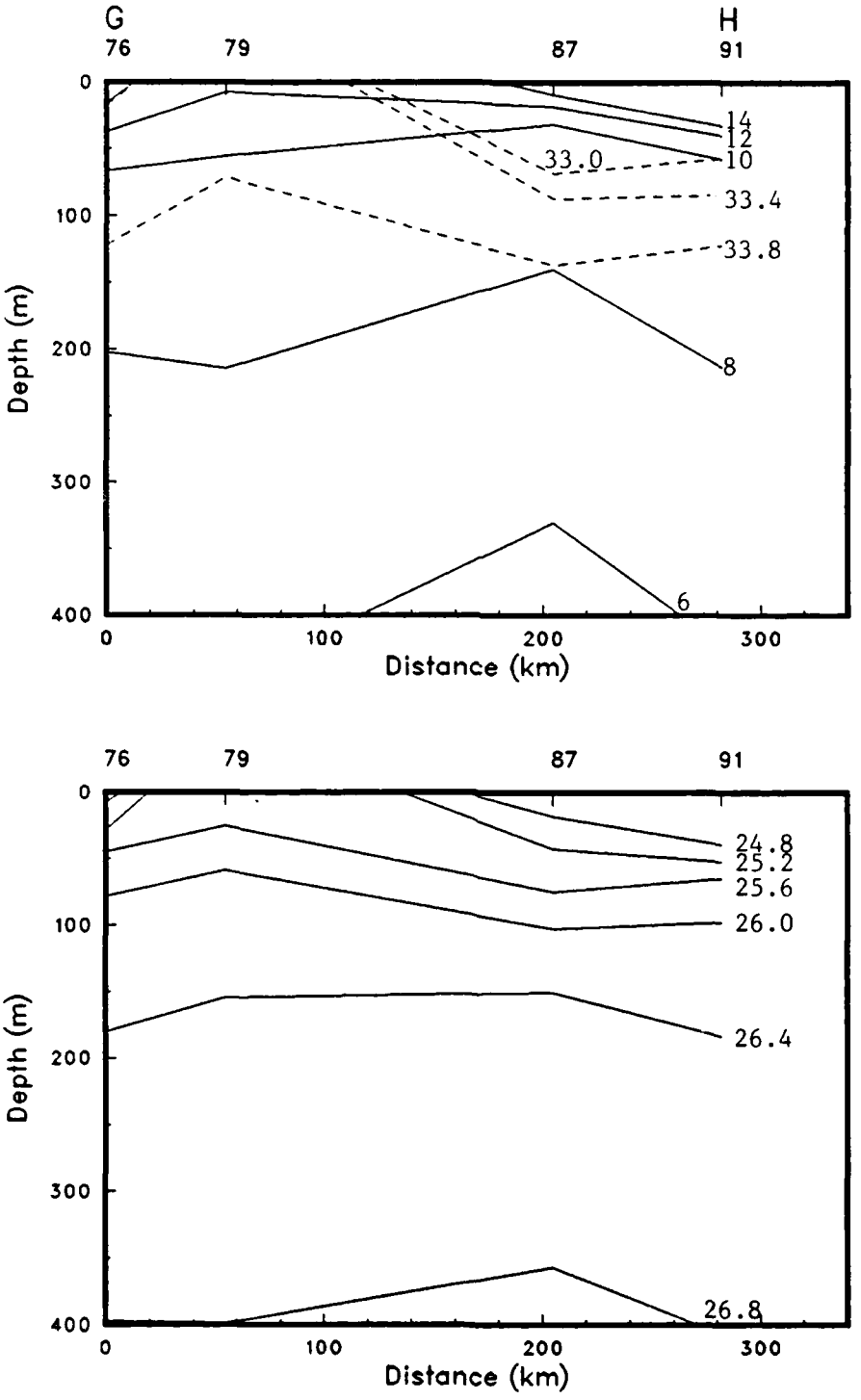
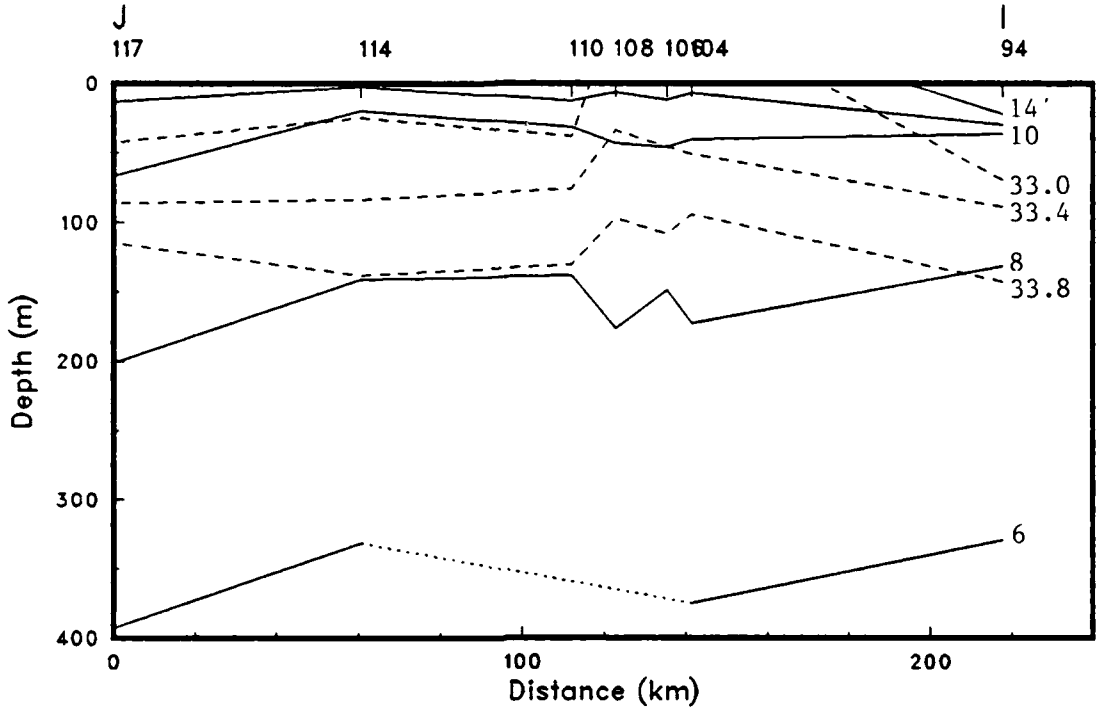


Figure 14(a): Isopleths of (1) temperature and salinity and (2) sigma-t from the CTD's (OPTOMA17, Leg DI).


J
I
117
114
110 108 106 104
94
0
100
200
300
400
Depth (m)
14
10
33.0
33.4
8
33.8
6
0
100
200
Distance (km)

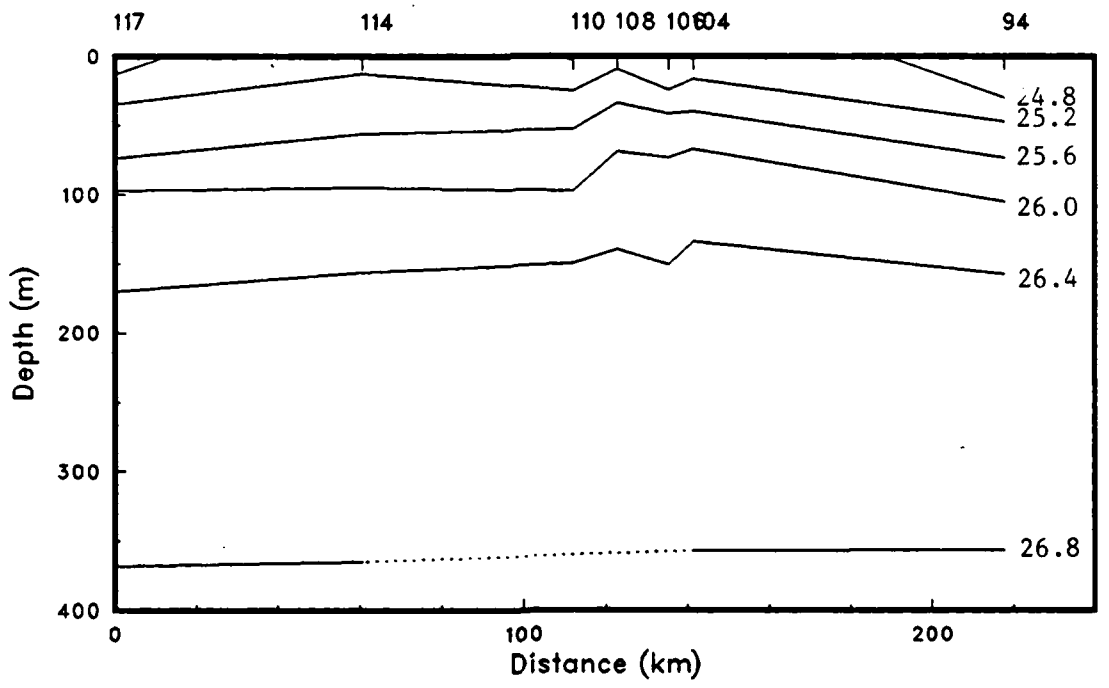

117
114
110 108 106 104
94
0
100
200
300
400
Depth (m)
24.8
25.2
25.6
26.0
26.4
26.8
0
100
200
Distance (km)

Figure 14(b)

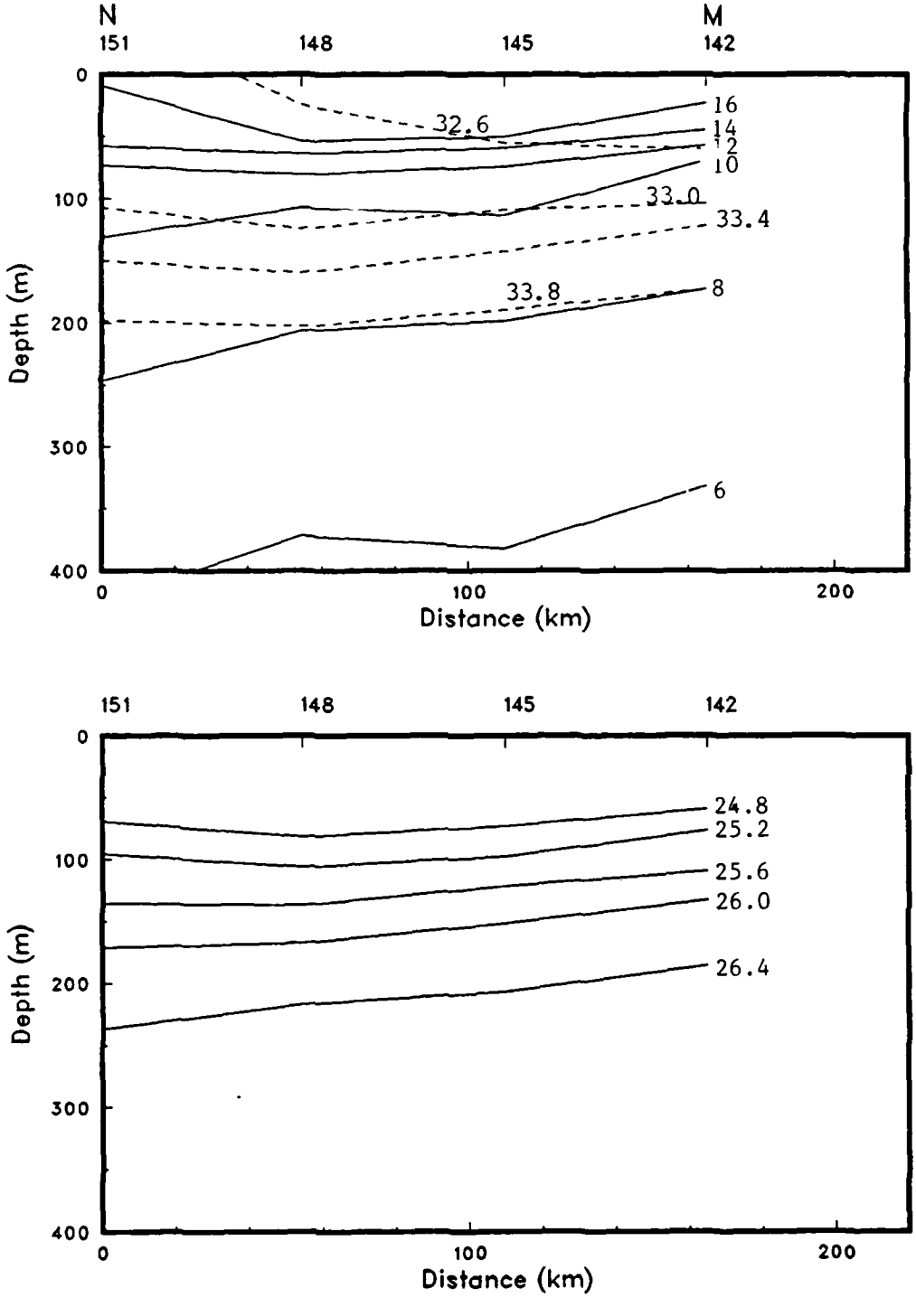

N
M
151
148
145
142
0
100
200
300
400
Depth (m)
32.6
16
14
12
10
33.0
33.4
33.8
8
6
0
100
200
Distance (km)
151
148
145
142
0
100
200
300
400
Depth (m)
24.8
25.2
25.6
26.0
26.4
0
100
200
Distance (km)

Figure 14(c)

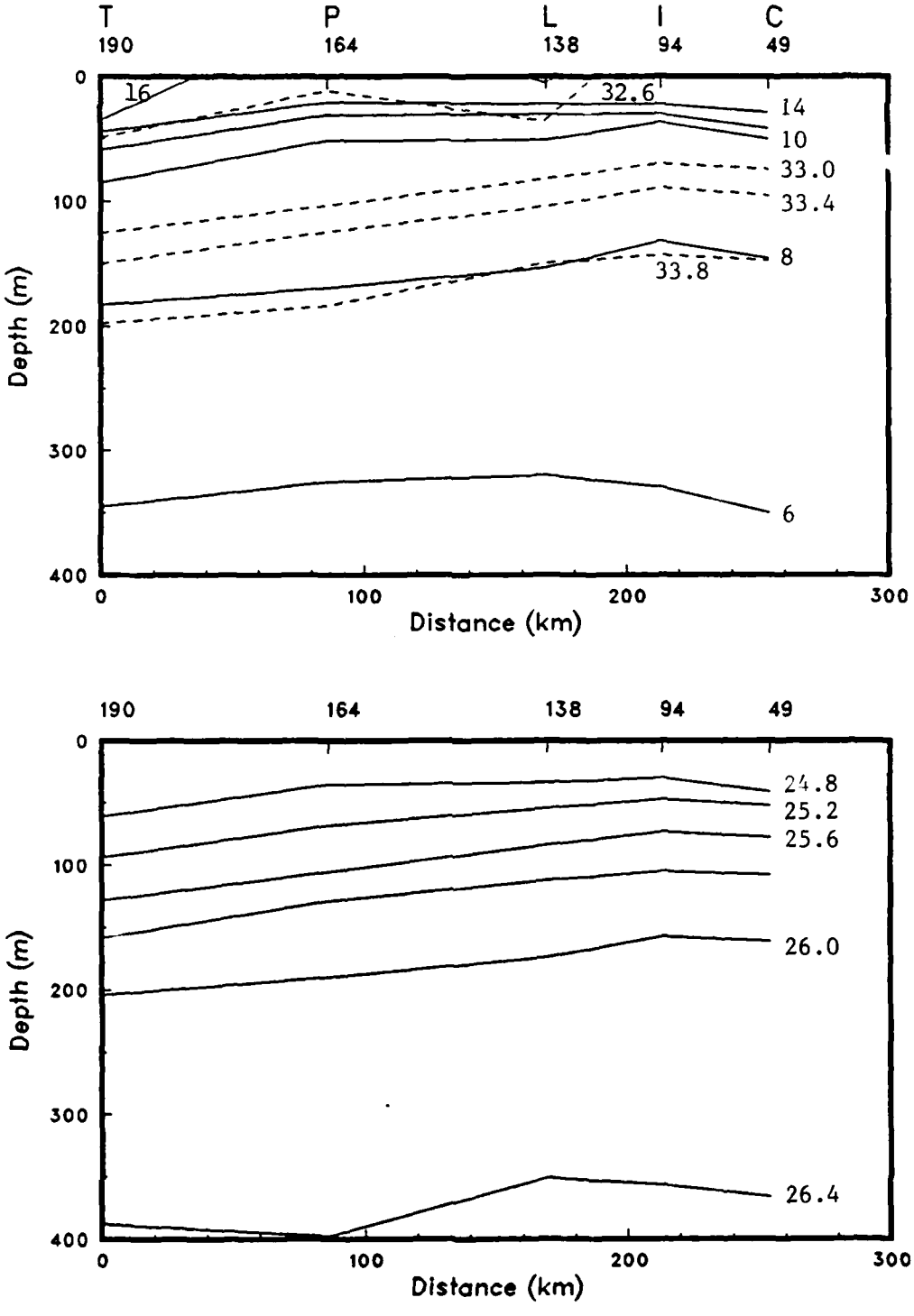

T P L I C
190 164 138 94 49
0
100
200
300
400
Depth (m)
16
32.6
14
10
33.0
33.4
8
33.8
6
0 100 200 300
Distance (km)
190 164 138 94 49
24.8
25.2
25.6
26.0
26.4
Distance (km)

Figure 14(d)

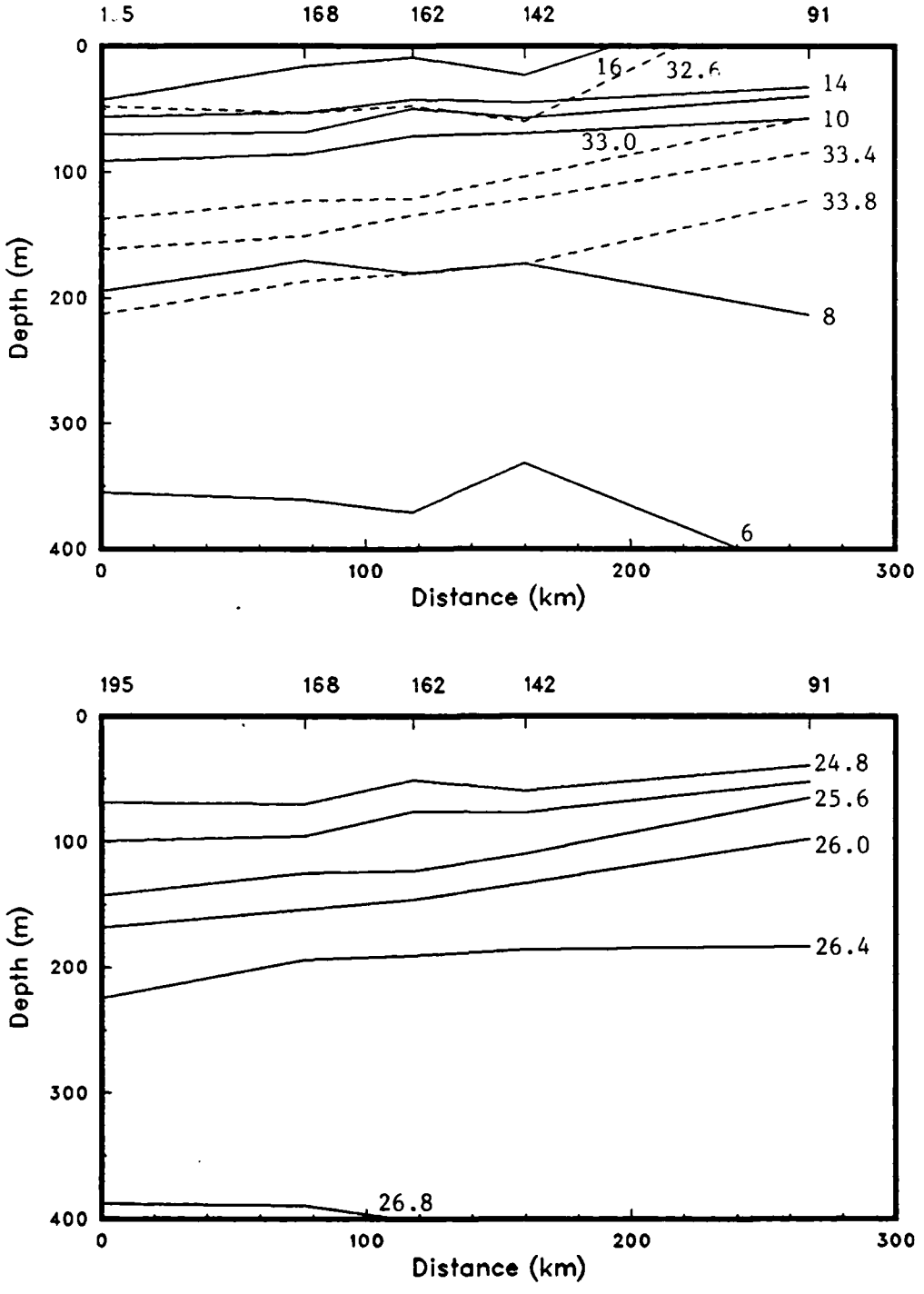

1.5
168
162
142
91
0
100
200
300
400
Depth (m)
16
32.6
14
10
33.0
33.4
33.8
8
6
0
100
200
300
Distance (km)
195
168
162
142
91
0
100
200
300
400
Depth (m)
24.8
25.6
26.0
26.4
26.8
0
100
200
300
Distance (km)

Figure 14(e)

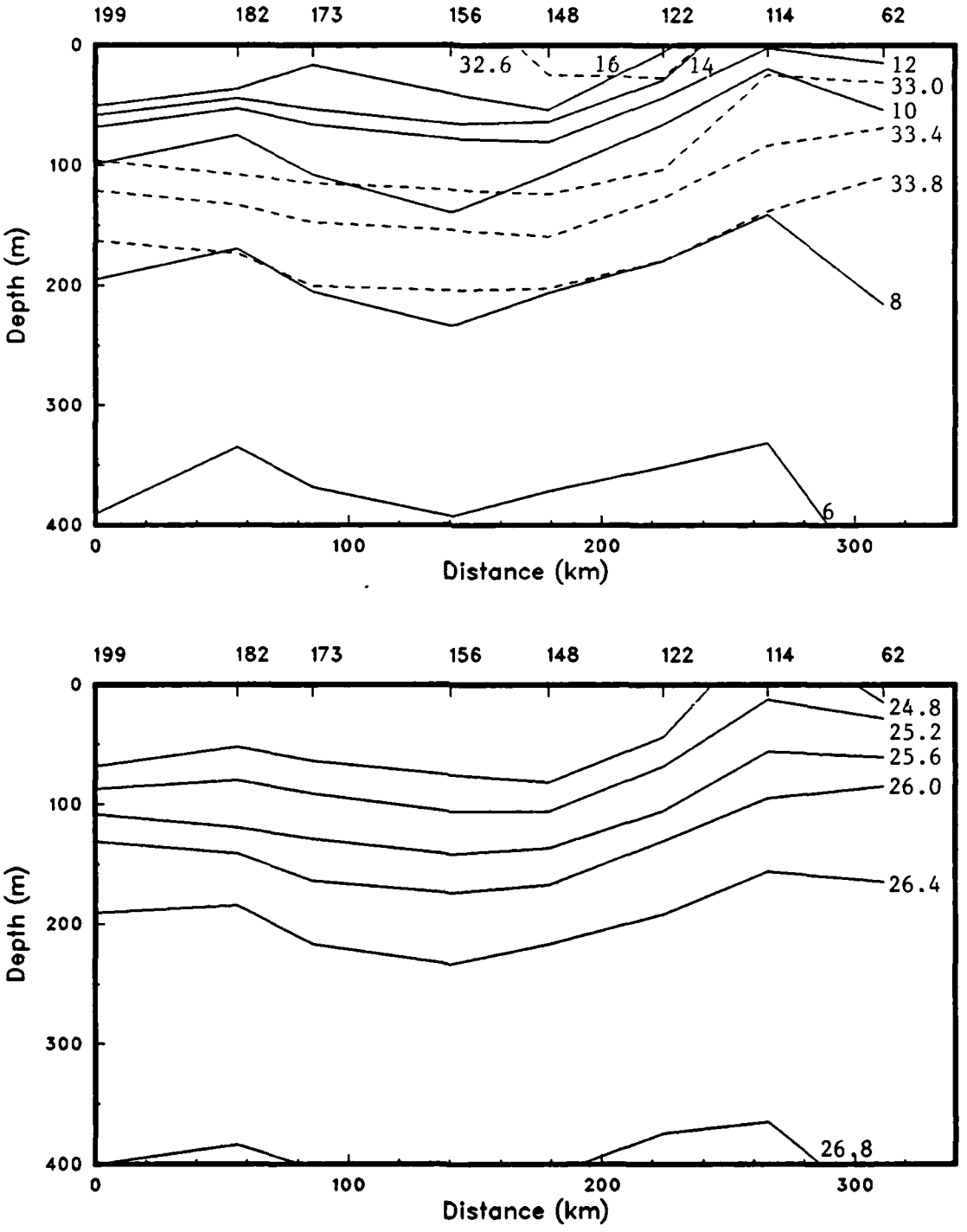

199
182
173
156
148
122
114
62
0
100
200
300
400
Depth (m)
32.6
16
14
12
33.0
10
33.4
33.8
8
6
0
100
200
300
Distance (km)
199
182
173
156
148
122
114
62
0
100
200
300
400
Depth (m)
24.8
25.2
25.6
26.0
26.4
26.8
0
100
200
300
Distance (km)

Figure 14(f)

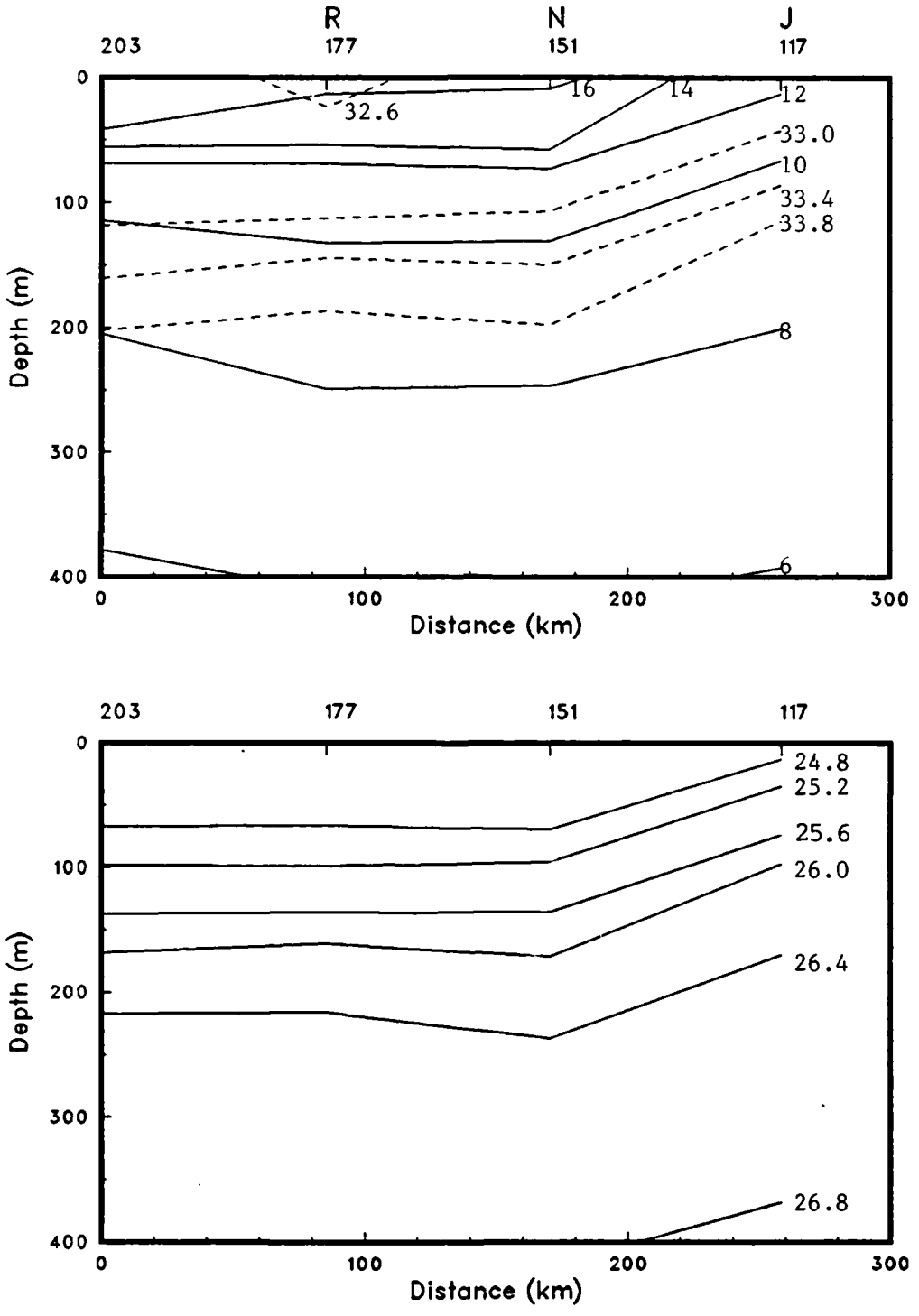

R
N
J
203
177
151
117
0
100
200
300
400
Depth (m)
0
100
200
300
Distance (km)
32.6
16
14
12
33.0
10
33.4
33.8
8
6
24.8
25.2
25.6
26.0
26.4
26.8

Figure 14(g)

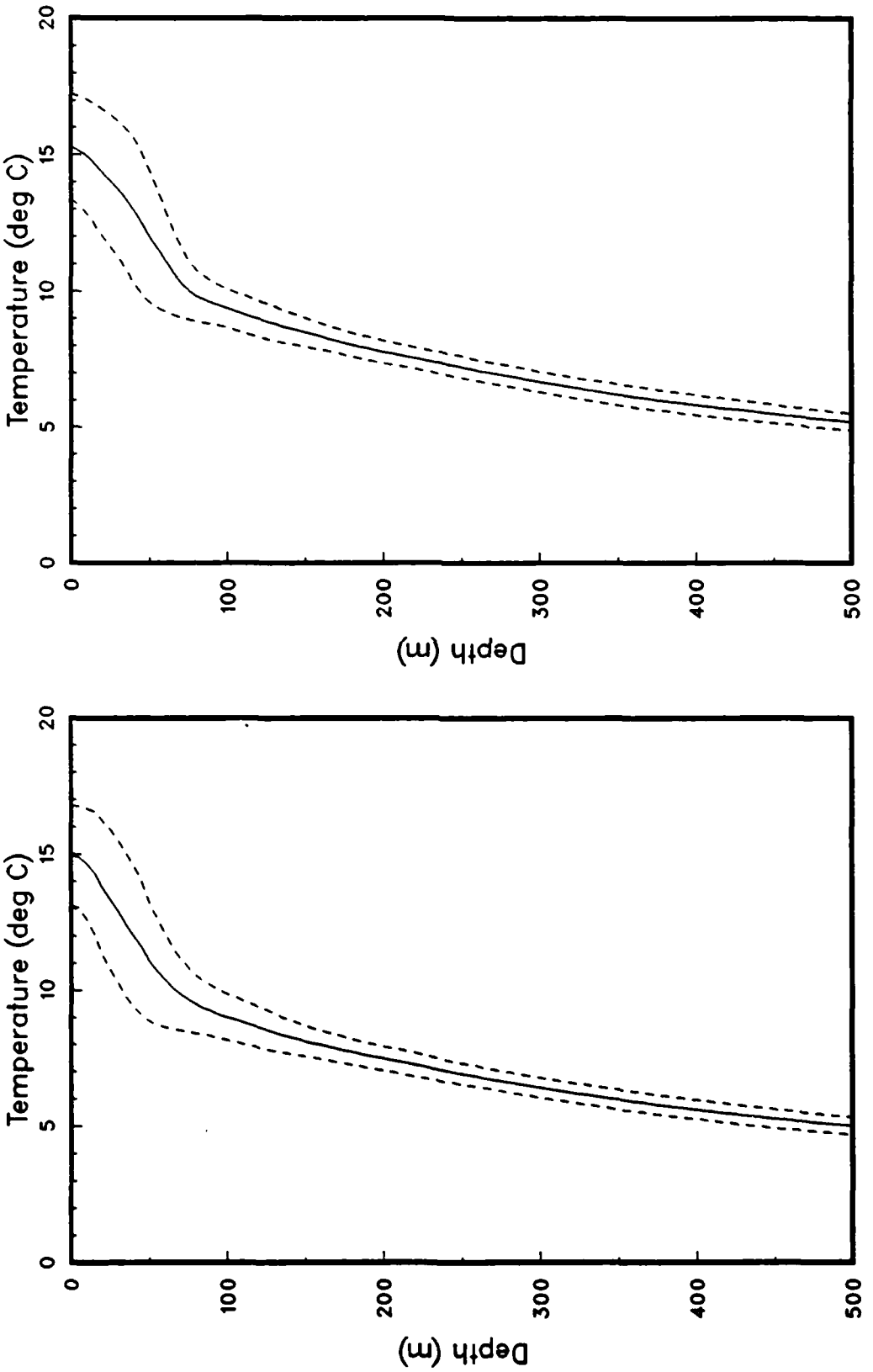


Figure 15: Mean temperature profiles from (a) XBT's and (b) CTD's, with + and - the standard deviation. (OPTOMA17, Leg DI).

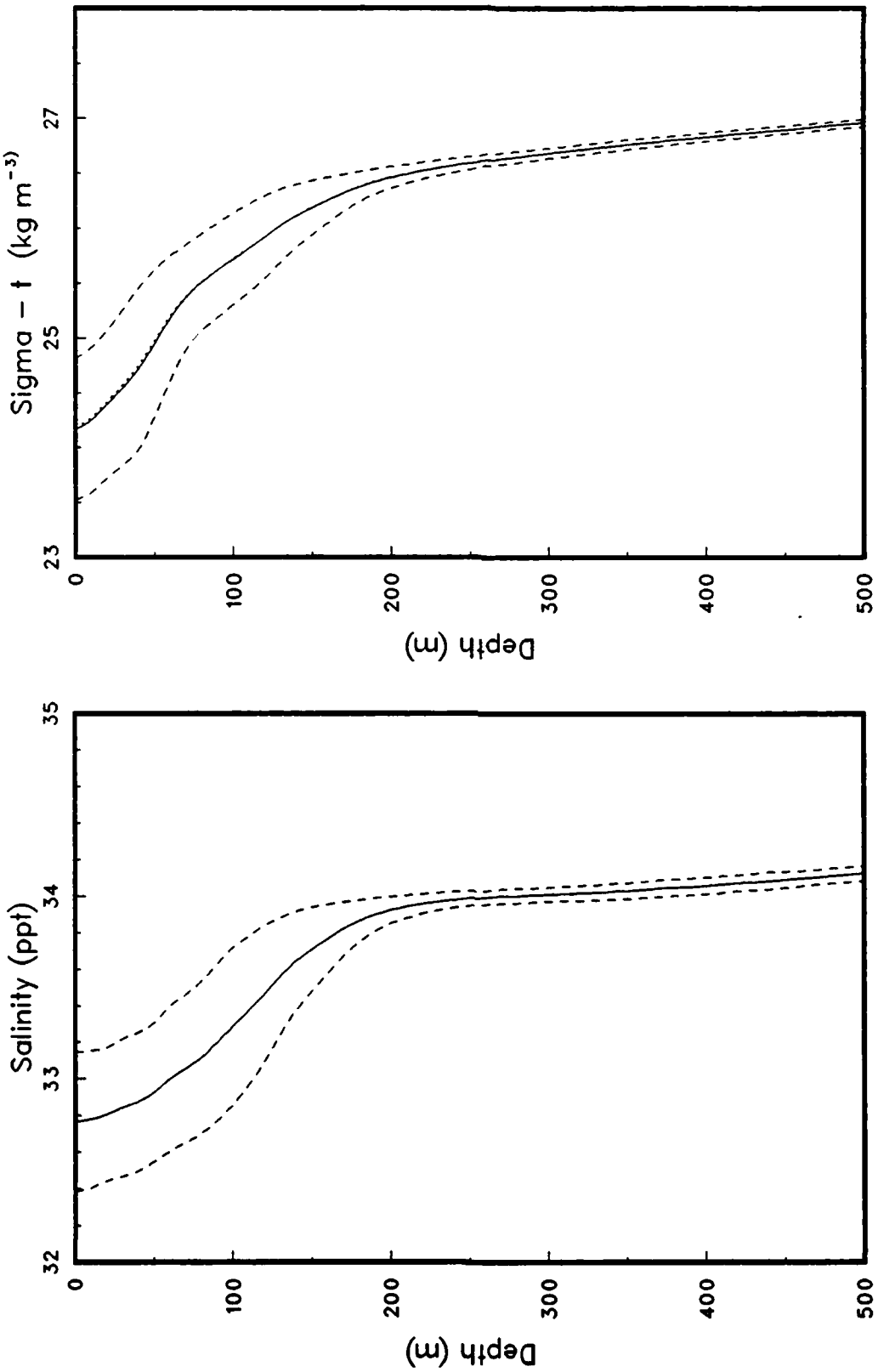


Figure 16: Mean profiles of (a) salinity and (b) sigma-t, with + and - the standard deviations, from the CTD's (OPTOMA17, Leg DI).

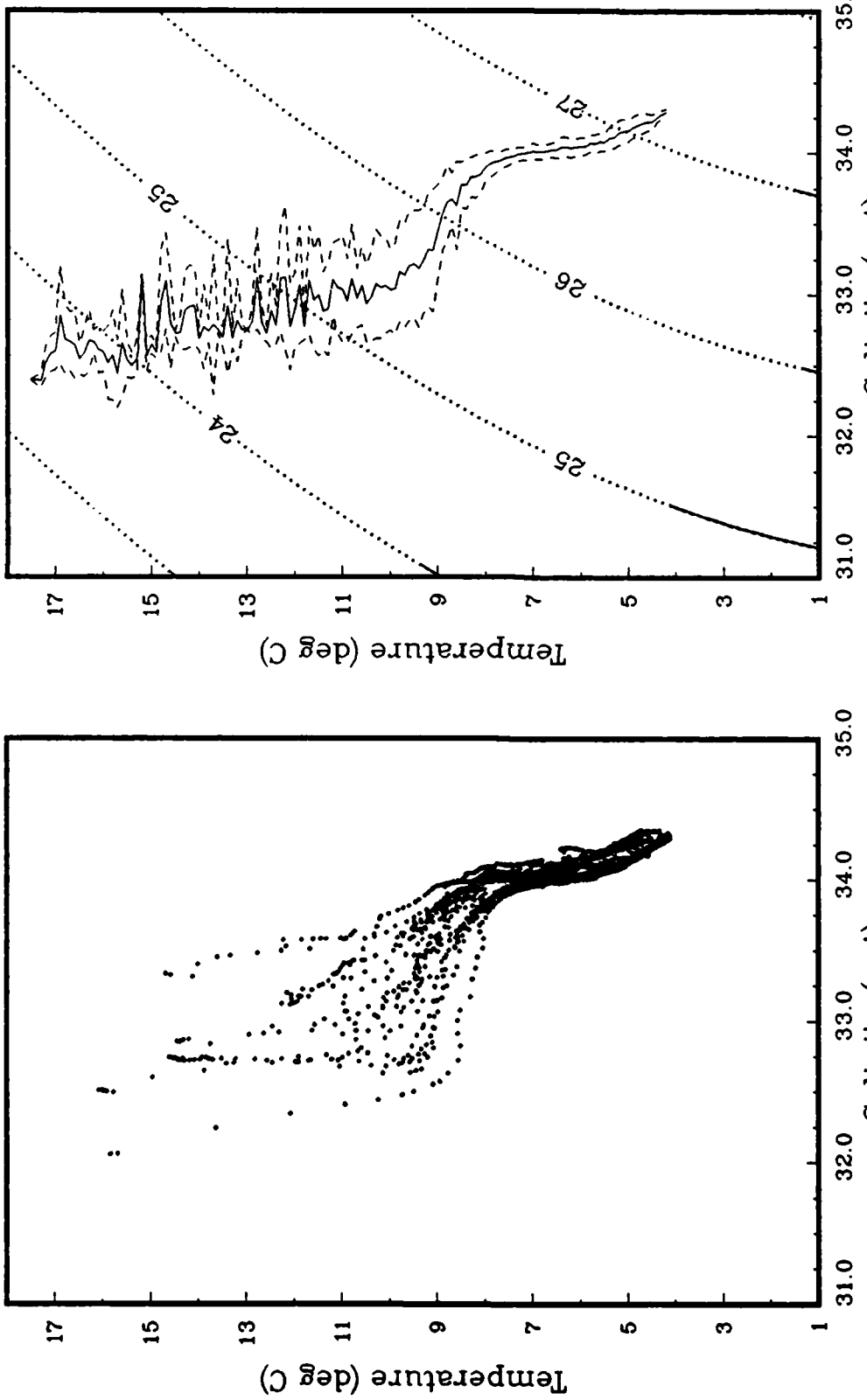


Figure 17: (a) T-S pairs and (b) mean T-S relation, with + and - the standard deviation, from the CTD's. Selected sigma-t contours are also shown. (OPTOMA17, Leg DI).

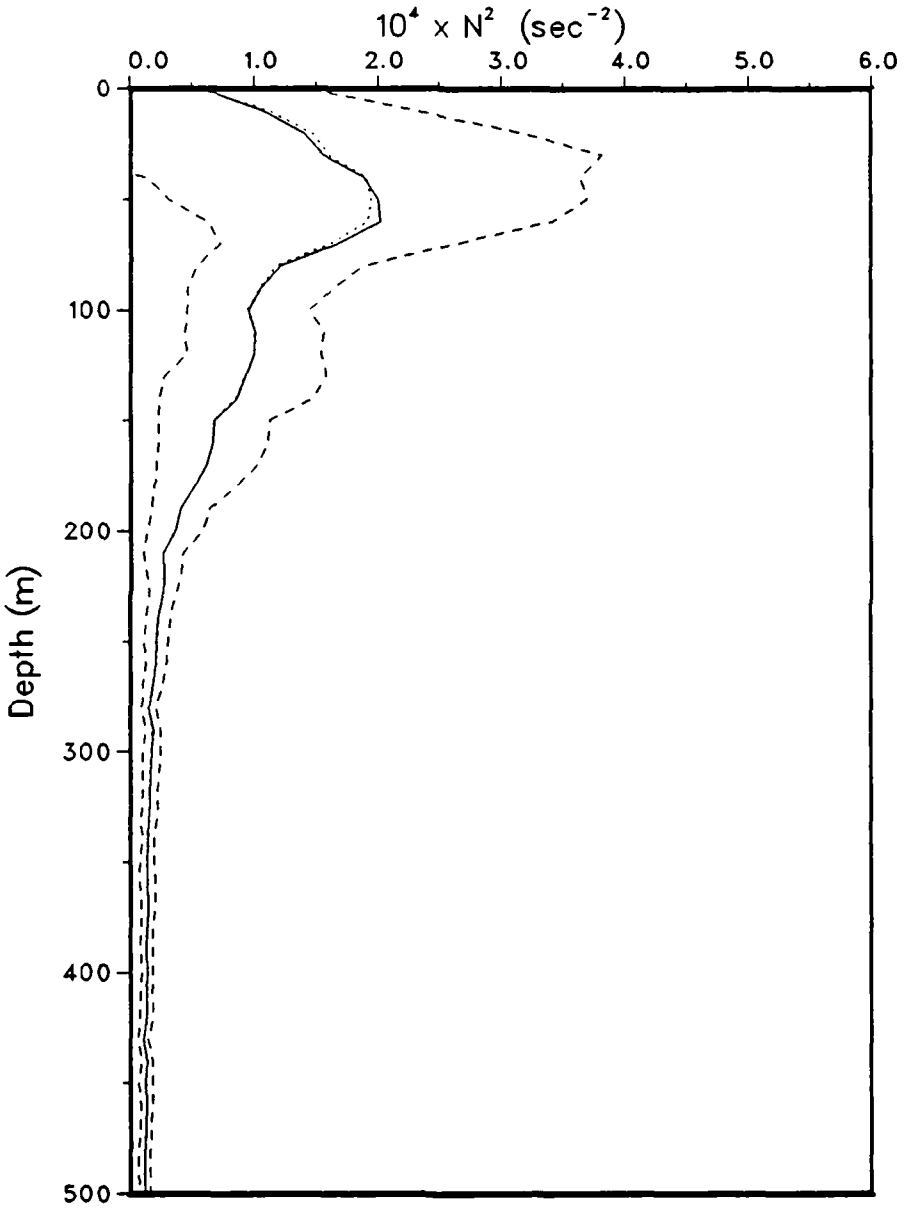


Figure 18: Mean N^2 profile (——), with + and - the standard deviation (---). The N^2 profile from $\overline{T(z)}$ and $\overline{S(z)}$ is also shown (···) (OPTOMA17, Leg DI).

Section 3

OPTOMA17 Leg DII

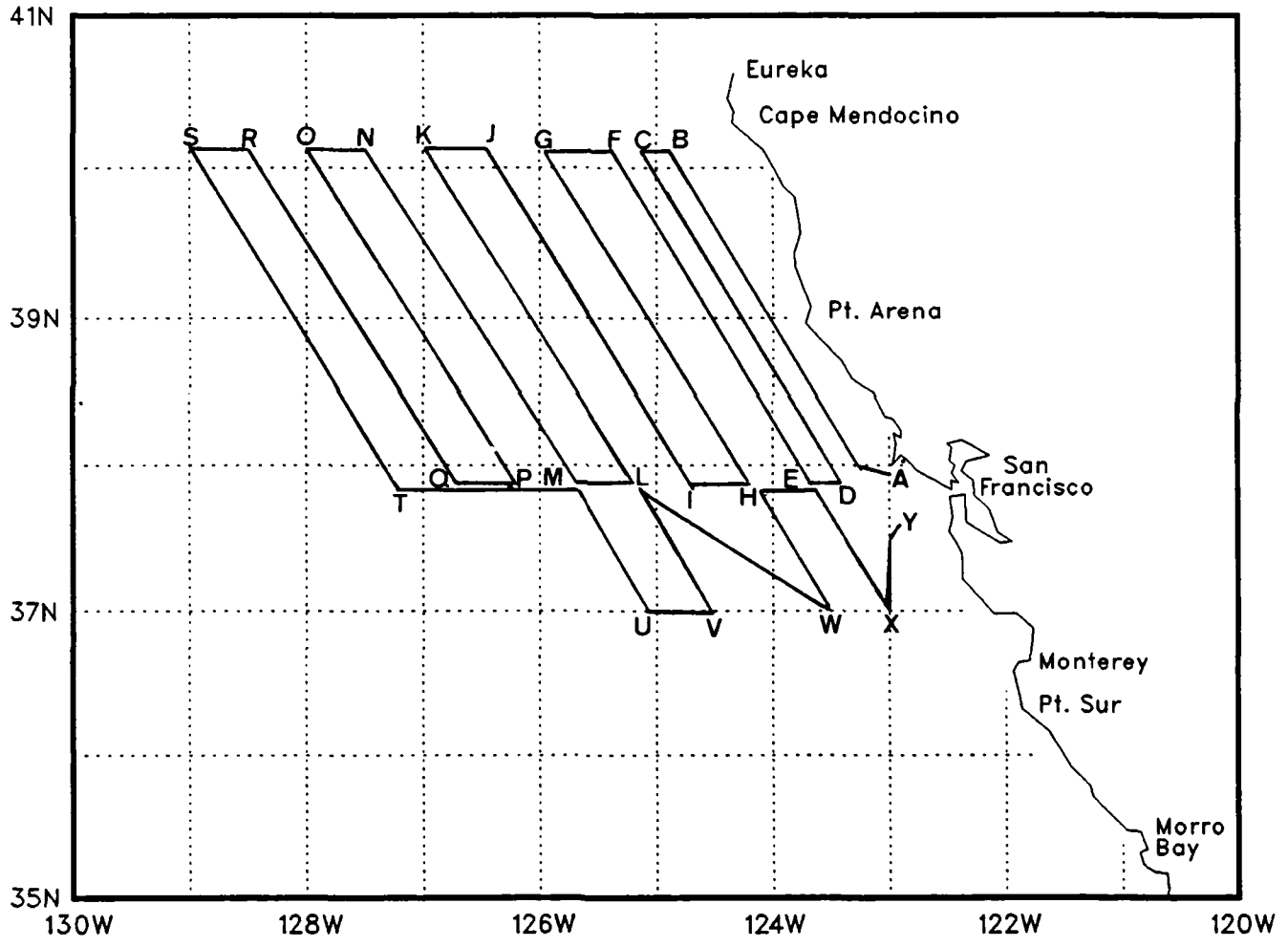


Figure 19: The cruise track for OPTOMA17, Leg DII.

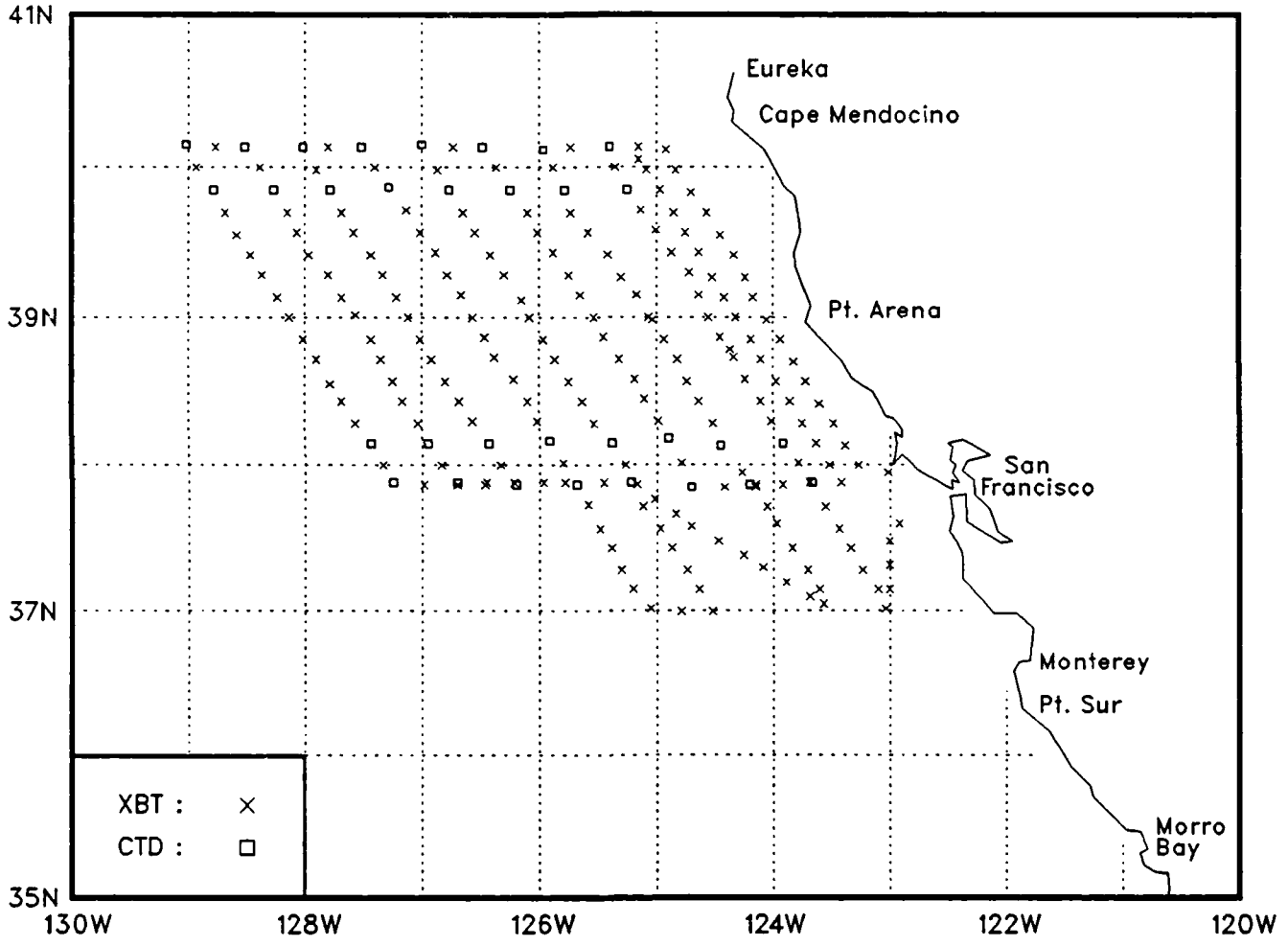


Figure 20: XBT and CTD locations for OPTOMA17, Leg DII.

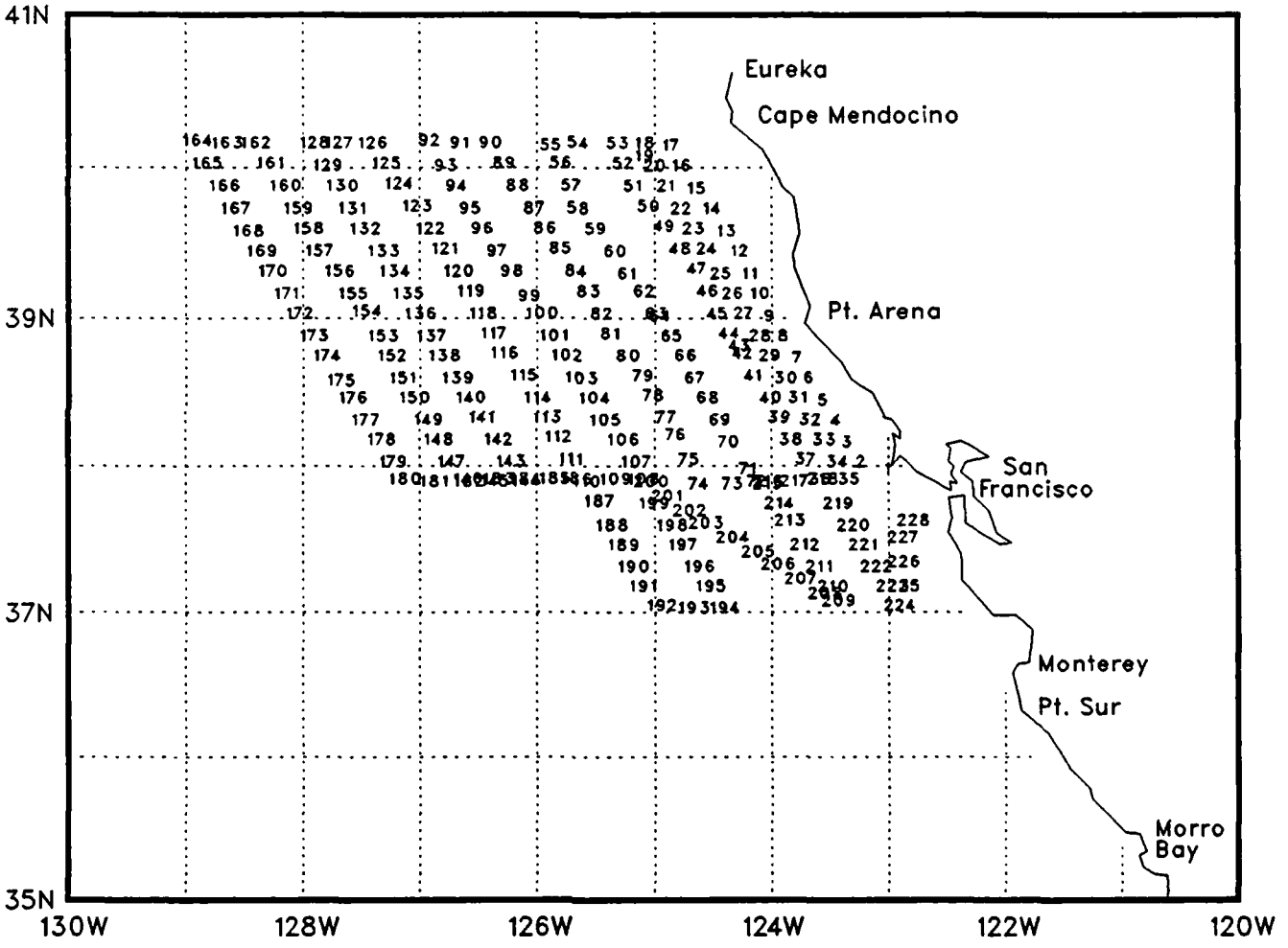


Figure 21: Station numbers for OPTOMA17, Leg DII.

Table 4: Leg DII Station Listing

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	DEEP SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
1	XBT	85235	1947	37.57	123.01	12.8			
2	XBT	85235	2053	38.00	123.16	14.3			
3	XBT	85235	2153	38.08	123.23	13.6			
4	XBT	85235	2258	38.17	123.29	13.4			
5	XBT	85235	2352	38.25	123.36	12.8			
6	XBT	85236	52	38.34	123.43	13.5			
7	XBT	85236	157	38.42	123.49	13.8			
8	XBT	85236	307	38.51	123.56	14.0			
9	XBT	85236	411	38.59	124.03	14.1			
10	XBT	85236	535	39.08	124.10	12.8			
11	XBT	85236	643	39.16	124.14	12.8			
12	XBT	85236	750	39.25	124.20	12.5			
13	XBT	85236	901	39.33	124.27	12.7			
14	XBT	85236	1015	39.42	124.34	11.8			
15	XBT	85236	1123	39.50	124.42	12.4			
16	XBT	85236	1239	39.59	124.50	11.3			
17	XBT	85236	1352	40.07	124.55	14.4			
18	XBT	85236	1514	40.08	125.09	14.4			
19	XBT	85236	1552	40.03	125.09	12.8			
20	XBT	85236	1622	39.59	125.05	13.6			
21	XBT	85236	1713	39.51	124.58	14.4			
22	XBT	85236	1810	39.42	124.51	13.4			
23	XBT	85236	1850	39.34	124.45	14.8			
24	XBT	85236	1944	39.26	124.38	15.4			
25	XBT	85236	2041	39.16	124.31	15.4			
26	XBT	85236	2130	39.08	124.25	14.5			
27	XBT	85236	2227	39.00	124.19	13.4			
28	XBT	85236	2325	38.51	124.11	13.4			
29	XBT	85237	20	38.43	124.06	14.2			
30	XBT	85237	54	38.34	123.58	13.8			
31	XBT	85237	144	38.26	123.51	14.0			
32	XBT	85237	236	38.17	123.45	13.7			
33	XBT	85237	327	38.09	123.38	13.9			
34	XBT	85237	422	38.00	123.31	14.1			
35	XBT	85237	506	37.53	123.25	14.1			
36	CTD	85237	652	37.53	123.40	14.1	34.65	14.4	*
37	XBT	85237	948	38.01	123.47	13.5			
38	CTD	85237	1118	38.09	123.55	13.3	34.65	13.8	34.64
39	XBT	85237	1406	38.18	124.01	14.0			
40	XBT	85237	1507	38.26	124.06	13.4			
41	XBT	85237	1611	38.35	124.14	13.4			
42	XBT	85237	1716	38.44	124.20	12.1			
43	XBT	85237	1738	38.47	124.22	13.3			
44	XBT	85237	1825	38.52	124.27	14.8			
45	XBT	85237	1922	39.00	124.33	16.3			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	DEEP SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
46	XBT	85237	2027	39.09	124.38	15.5			
47	XBT	85237	2122	39.18	124.43	14.7			
48	XBT	85237	2230	39.26	124.52	14.7			
49	XBT	85237	2330	39.35	125.00	14.7			
50	XBT	85238	24	39.43	125.08	14.8			
51	CTD	85238	122	39.51	125.15	14.9	34.61	14.9	34.61
52	XBT	85238	344	40.00	125.21	13.3			
53	CTD	85238	443	40.08	125.24	14.6	34.59	14.9	34.59
54	XBT	85238	717	40.08	125.44	14.6			
55	CTD	85238	827	40.07	125.58	16.7	34.66	16.7	34.67
56	XBT	85238	1119	40.00	125.53	15.9			
57	CTD	85238	1227	39.51	125.47	14.1	34.66	14.8	34.66
58	XBT	85238	1522	39.42	125.44	14.7			
59	XBT	85238	1627	39.34	125.35	14.2			
60	XBT	85238	1719	39.25	125.25	14.5			
61	XBT	85238	1819	39.16	125.18	15.8			
62	XBT	85238	1902	39.09	125.10	16.3			
63	XBT	85238	1958	39.00	125.04	16.5			
64	XBT	85238	2010	38.59	125.02	16.5			
65	XBT	85238	2058	38.51	124.56	16.5			
66	XBT	85238	2147	38.43	124.49	16.5			
67	XBT	85238	2241	38.34	124.44	16.6			
68	XBT	85238	2327	38.26	124.38	16.6			
69	XBT	85239	50	38.17	124.31	15.2			
70	CTD	85239	200	38.08	124.27	14.7	34.67	15.1	34.65
71	XBT	85239	602	37.57	124.16	14.1			
72	CTD	85239	701	37.52	124.12	13.7	34.66	14.5	34.67
73	XBT	85239	1022	37.51	124.25	15.1			
74	CTD	85239	1138	37.51	124.42	16.3	34.67	16.2	34.66
75	XBT	85239	1446	38.01	124.47	16.4			
76	CTD	85239	1553	38.11	124.54	15.8	34.65	16.0	34.65
77	XBT	85239	1859	38.18	124.59	16.3			
78	XBT	85239	1957	38.27	125.06	16.4			
79	XBT	85239	2057	38.35	125.11	16.3			
80	XBT	85239	2155	38.43	125.19	16.6			
81	XBT	85239	2301	38.52	125.27	16.8			
82	XBT	85239	2356	39.00	125.32	16.4			
83	XBT	85240	106	39.09	125.39	16.6			
84	XBT	85240	205	39.17	125.45	15.8			
85	XBT	85240	305	39.26	125.53	14.8			
86	XBT	85240	431	39.34	126.01	16.4			
87	XBT	85240	531	39.42	126.06	16.4			
88	CTD	85240	705	39.51	126.15	16.6	34.66	16.4	*
89	XBT	85240	1018	40.00	126.22	16.6			
90	CTD	85240	1127	40.08	126.29	16.7	34.66	16.4	34.68

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	DEEP SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
91	XBT	85240	1435	40.08	126.44	16.7			
92	CTD	85240	1548	40.09	127.00	17.3	34.66	17.4	34.67
93	XBT	85240	1852	39.59	126.52	16.6			
94	CTD	85240	2003	39.51	126.46	17.2	34.66	16.9	*
95	XBT	85240	2313	39.42	126.39	16.8			
96	XBT	85241	7	39.34	126.33	16.8			
97	XBT	85241	106	39.25	126.25	16.6			
98	XBT	85241	200	39.17	126.18	16.6			
99	XBT	85241	300	39.07	126.09	16.6			
100	XBT	85241	343	39.00	126.05	16.5			
101	XBT	85241	446	38.51	125.58	16.5			
102	XBT	85241	538	38.43	125.52	16.4			
103	XBT	85241	630	38.34	125.45	16.2			
104	XBT	85241	727	38.26	125.38	16.1			
105	XBT	85241	823	38.17	125.32	15.9			
106	CTD	85241	1039	38.09	125.23	16.2	34.66	16.0	34.66
107	XBT	85241	1306	38.00	125.16	16.4			
108	CTD	85241	1406	37.53	125.13	16.1	34.66	16.3	34.66
109	XBT	85241	1719	37.53	125.27	16.1			
110	CTD	85241	1825	37.52	125.41	16.7	34.66	17.4	34.65
111	XBT	85241	2128	38.01	125.48	16.9			
112	CTD	85241	2314	38.10	125.55	17.0	34.66	17.4	34.65
113	XBT	85242	123	38.18	126.01	16.8			
114	XBT	85242	215	38.26	126.06	16.8			
115	XBT	85242	315	38.35	126.13	16.8			
116	XBT	85242	359	38.44	126.23	16.8			
117	XBT	85242	453	38.52	126.28	16.8			
118	XBT	85242	540	39.00	126.34	16.8			
119	XBT	85242	639	39.09	126.40	17.2			
120	XBT	85242	727	39.17	126.47	16.9			
121	XBT	85242	825	39.26	126.53	16.8			
122	XBT	85242	922	39.34	127.01	17.0			
123	XBT	85242	1022	39.43	127.08	17.1			
124	CTD	85242	1127	39.52	127.17	17.2	34.66	17.6	34.65
125	XBT	85242	1422	40.00	127.24	17.1			
126	CTD	85242	1531	40.08	127.31	17.2	34.66	17.9	34.66
127	XBT	85242	1850	40.08	127.48	17.5			
128	CTD	85242	2103	40.08	128.01	17.6	34.66	18.5	34.66
129	XBT	85242	2313	39.59	127.54	17.6			
130	CTD	85242	101	39.51	127.47	17.3	34.66	18.4	*
131	XBT	85243	257	39.42	127.41	17.9			
132	XBT	85243	340	39.34	127.35	17.3			
133	XBT	85243	439	39.25	127.26	17.2			
134	XBT	85243	535	39.17	127.20	17.0			
135	XBT	85243	639	39.08	127.13	16.8			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	DEEP SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
136	XBT	85243	739	39.00	127.07	16.6			
137	XBT	85243	847	38.51	127.01	16.7			
138	XBT	85243	939	38.43	126.55	16.6			
139	XBT	85243	1057	38.34	126.48	16.6			
140	XBT	85243	1156	38.26	126.41	16.9			
141	XBT	85243	1251	38.18	126.34	16.9			
142	CTD	85243	1410	38.09	126.26	17.0	34.66	17.6	34.67
143	XBT	85243	1705	38.00	126.20	17.0			
144	CTD	85243	1900	37.52	126.12	17.2	34.66	18.2	34.66
145	XBT	85243	2130	37.52	126.28	17.2			
146	CTD	85243	2325	37.53	126.42	17.3	34.66	17.6	34.66
147	XBT	85244	123	38.00	126.50	17.3			
148	CTD	85244	306	38.09	126.57	17.3	34.66	17.9	34.66
149	XBT	85244	602	38.17	127.02	17.2			
150	XBT	85244	706	38.26	127.10	16.9			
151	XBT	85244	759	38.34	127.15	17.6			
152	XBT	85244	856	38.43	127.21	17.1			
153	XBT	85244	947	38.51	127.26	17.3			
154	XBT	85244	1056	39.01	127.34	17.3			
155	XBT	85244	1147	39.08	127.41	17.3			
156	XBT	85244	1244	39.17	127.48	17.3			
157	XBT	85244	1347	39.25	127.58	16.9			
158	XBT	85244	1450	39.34	128.04	17.7			
159	XBT	85244	1544	39.42	128.09	18.0			
160	CTD	85244	1700	39.51	128.16	18.0	34.66	18.0	*
161	XBT	85244	2007	40.00	128.23	17.9			
162	CTD	85244	2208	40.08	128.31	18.2	34.65	18.0	*
163	XBT	85245	22	40.08	128.46	18.3			
164	CTD	85245	230	40.09	129.01	18.3	34.65	18.5	34.66
165	XBT	85245	431	40.00	128.56	18.2			
166	CTD	85245	538	39.51	128.47	18.3	34.66	18.6	*
167	XBT	85245	834	39.42	128.41	18.1			
168	XBT	85245	927	39.33	128.35	17.8			
169	XBT	85245	1022	39.25	128.28	17.7			
170	XBT	85245	1123	39.17	128.22	17.5			
171	XBT	85245	1225	39.08	128.14	17.1			
172	XBT	85245	1311	39.00	128.08	17.1			
173	XBT	85245	1414	38.51	128.01	16.9			
174	XBT	85245	1511	38.43	127.54	17.2			
175	XBT	85245	1600	38.33	127.47	17.1			
176	XBT	85245	1644	38.26	127.41	17.1			
177	XBT	85245	1752	38.17	127.34	17.1			
178	CTD	85245	2000	38.09	127.26	17.3	34.66	17.7	*
179	XBT	85245	2236	38.00	127.20	17.2			
180	CTD	85246	101	37.53	127.15	17.2	34.66	17.5	*

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	DEEP SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
181	XBT	85246	307	37.52	126.59	17.5			
182	XBT	85246	434	37.52	126.42	17.3			
183	XBT	85246	544	37.53	126.27	17.4			
184	XBT	85246	650	37.53	126.13	17.3			
185	XBT	85246	806	37.53	125.58	15.5			
186	XBT	85246	927	37.53	125.47	16.4			
187	XBT	85246	1030	37.44	125.35	15.6			
188	XBT	85246	1135	37.34	125.29	15.0			
189	XBT	85246	1232	37.26	125.23	16.0			
190	XBT	85246	1328	37.17	125.18	17.1			
191	XBT	85246	1421	37.09	125.12	17.2			
192	XBT	85246	1527	37.01	125.03	17.1			
193	XBT	85246	1646	37.00	124.47	17.2			
194	XBT	85246	1758	37.00	124.31	17.2			
195	XBT	85246	1930	37.09	124.38	17.2			
196	XBT	85246	2041	37.17	124.44	17.2			
197	XBT	85246	2208	37.26	124.52	17.0			
198	XBT	85246	2319	37.34	124.58	15.6			
199	XBT	85247	51	37.43	125.07	16.3			
200	XBT	85247	209	37.52	125.10	16.4			
201	XBT	85247	311	37.46	125.01	16.0			
202	XBT	85247	421	37.40	124.50	15.1			
203	XBT	85247	510	37.35	124.42	13.9			
204	XBT	85247	628	37.29	124.28	17.2			
205	XBT	85247	742	37.23	124.15	17.1			
206	XBT	85247	840	37.18	124.05	17.4			
207	XBT	85247	946	37.12	123.53	17.3			
208	XBT	85247	1050	37.06	123.41	17.3			
209	XBT	85247	1128	37.03	123.34	17.3			
210	XBT	85247	1218	37.09	123.36	15.3			
211	XBT	85247	1335	37.17	123.42	14.7			
212	XBT	85247	1500	37.26	123.50	14.4			
213	XBT	85247	1636	37.36	123.58	14.3			
214	XBT	85247	1730	37.43	124.03	16.0			
215	XBT	85247	1833	37.51	124.09	13.4			
216	XBT	85247	1857	37.52	124.09	13.3			
217	XBT	85247	2000	37.52	123.55	13.2			
218	XBT	85247	2055	37.53	123.41	15.0			
219	XBT	85247	2203	37.43	123.33	14.5			
220	XBT	85247	2305	37.34	123.26	13.3			
221	XBT	85248	13	37.26	123.20	13.3			
222	XBT	85248	132	37.17	123.14	13.9			
223	XBT	85248	247	37.09	123.06	17.0			
224	XBT	85248	421	37.01	123.02	17.6			
225	XBT	85248	531	37.09	123.00	17.2			

STN	TYPE	YR/DAY	GMT	LAT (NORTH) DD.MM	LONG (WEST) DDD.MM	SURFACE TEMP (DEG C)	DEEP SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
226	XBT	85248	702	37.19	123.00	14.6			
227	XBT	85248	836	37.29	123.00	13.7			
228	XBT	85248	1021	37.36	122.55	14.5			

* Data not available

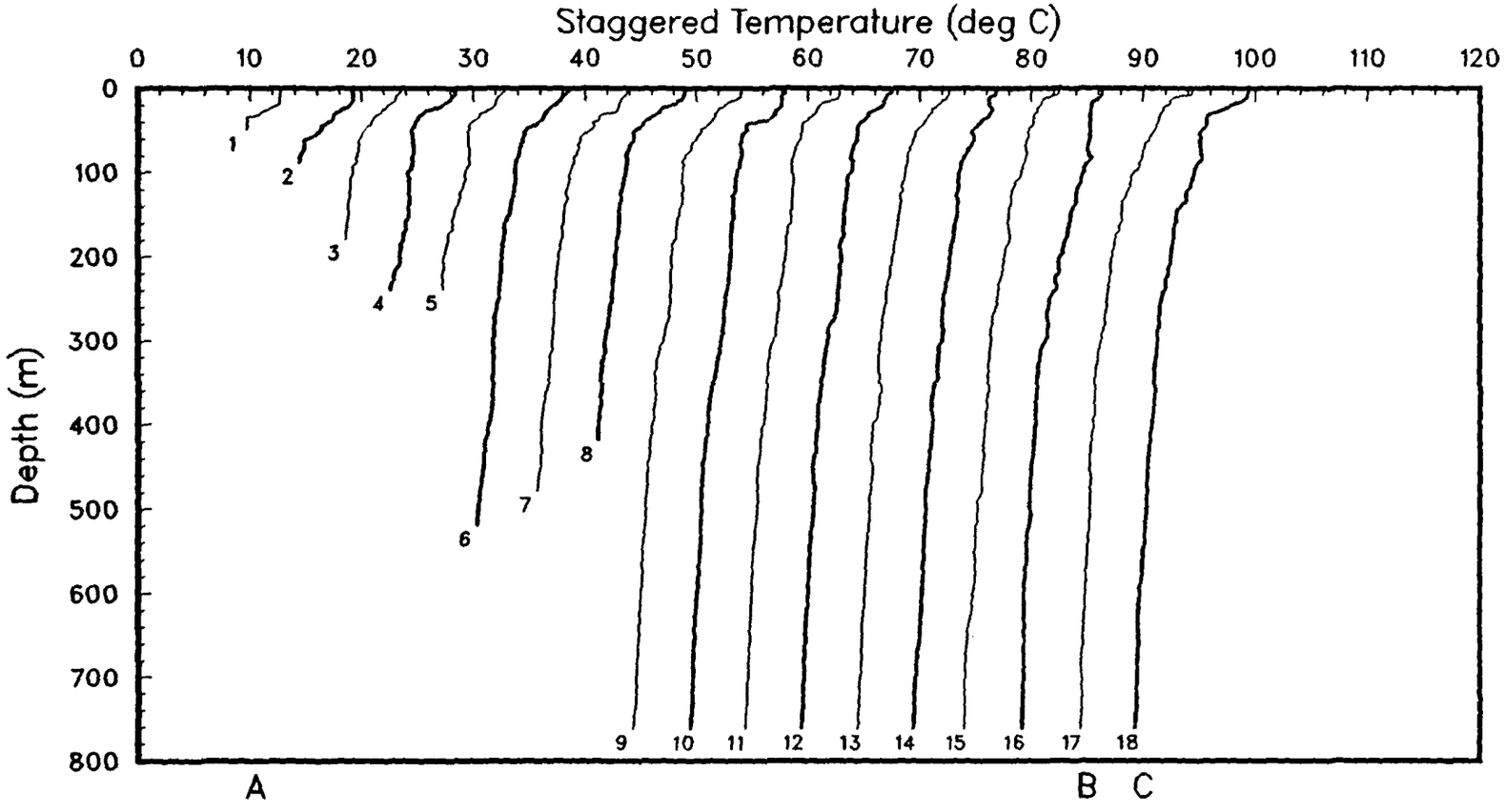


Figure 22(a): XBT temperature profiles, staggered by multiples of 5C (OPTOMA17, Leg DI1).

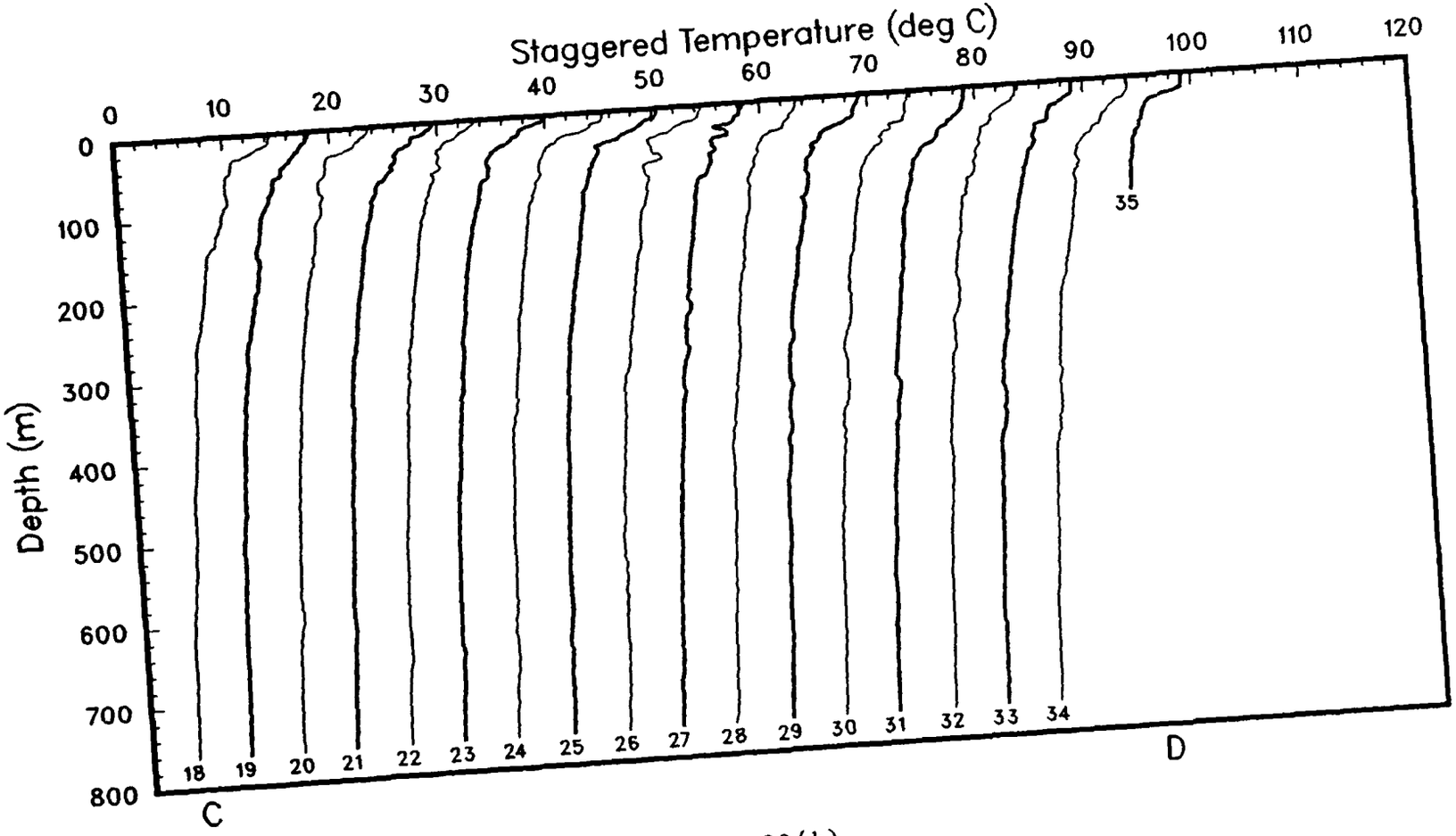

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
C
D

Figure 22(b)

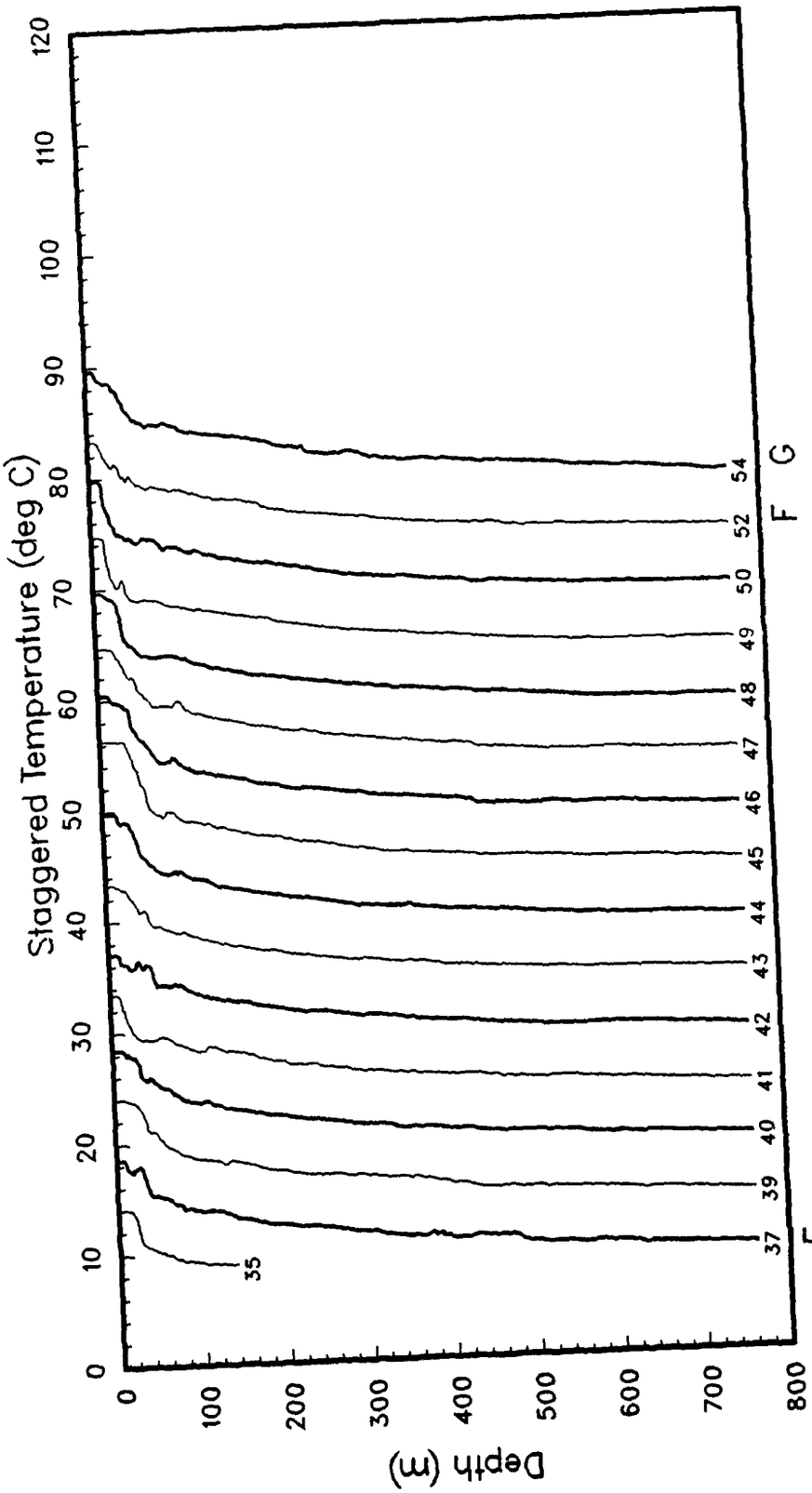

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
35
37
39
40
41
42
43
44
45
46
47
48
49
50
52
54
E
F
G

Figure 22(c)

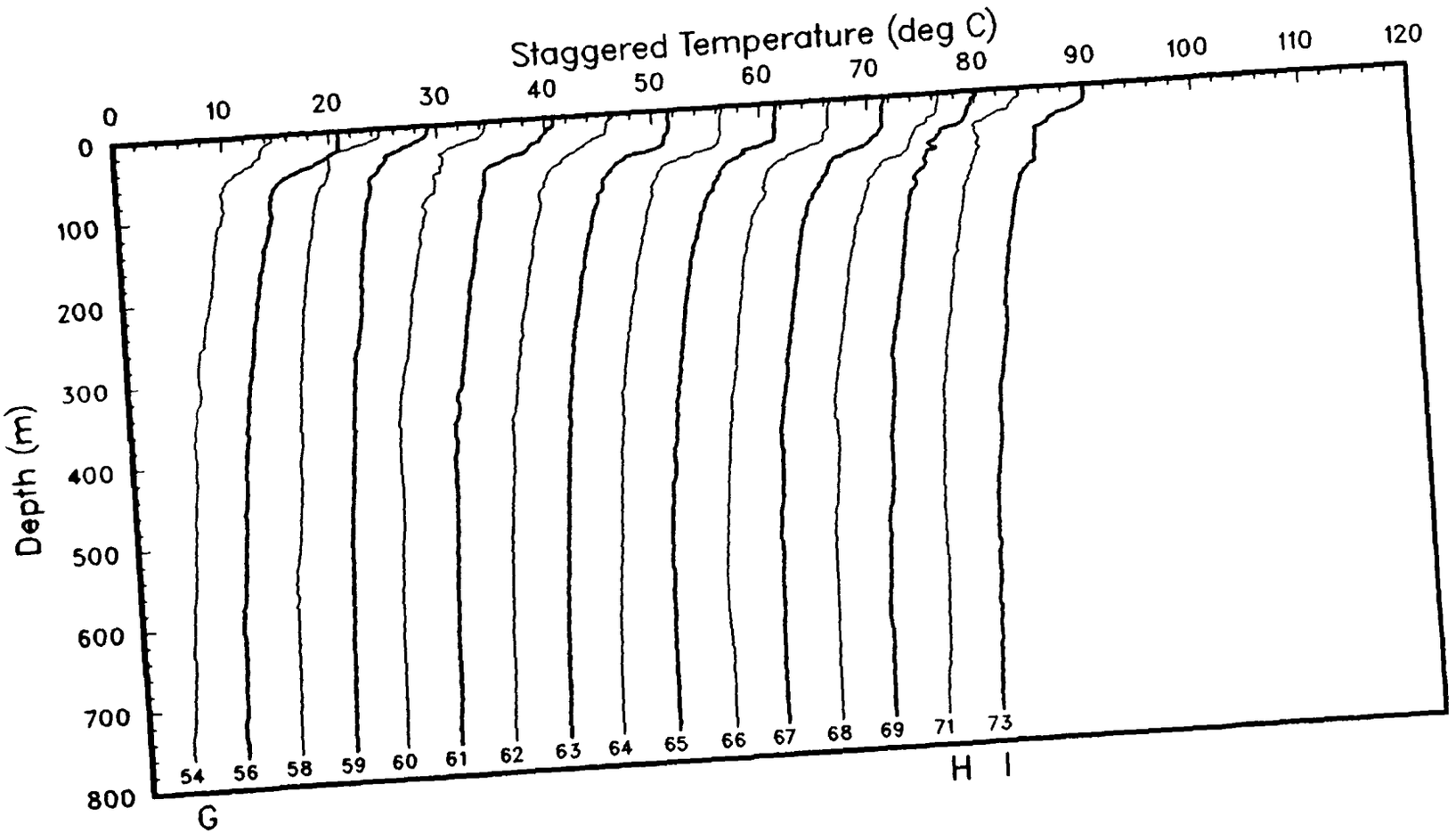

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
54
56
58
59
60
61
62
63
64
65
66
67
68
69
71
73
G
H
I

Figure 22(d)

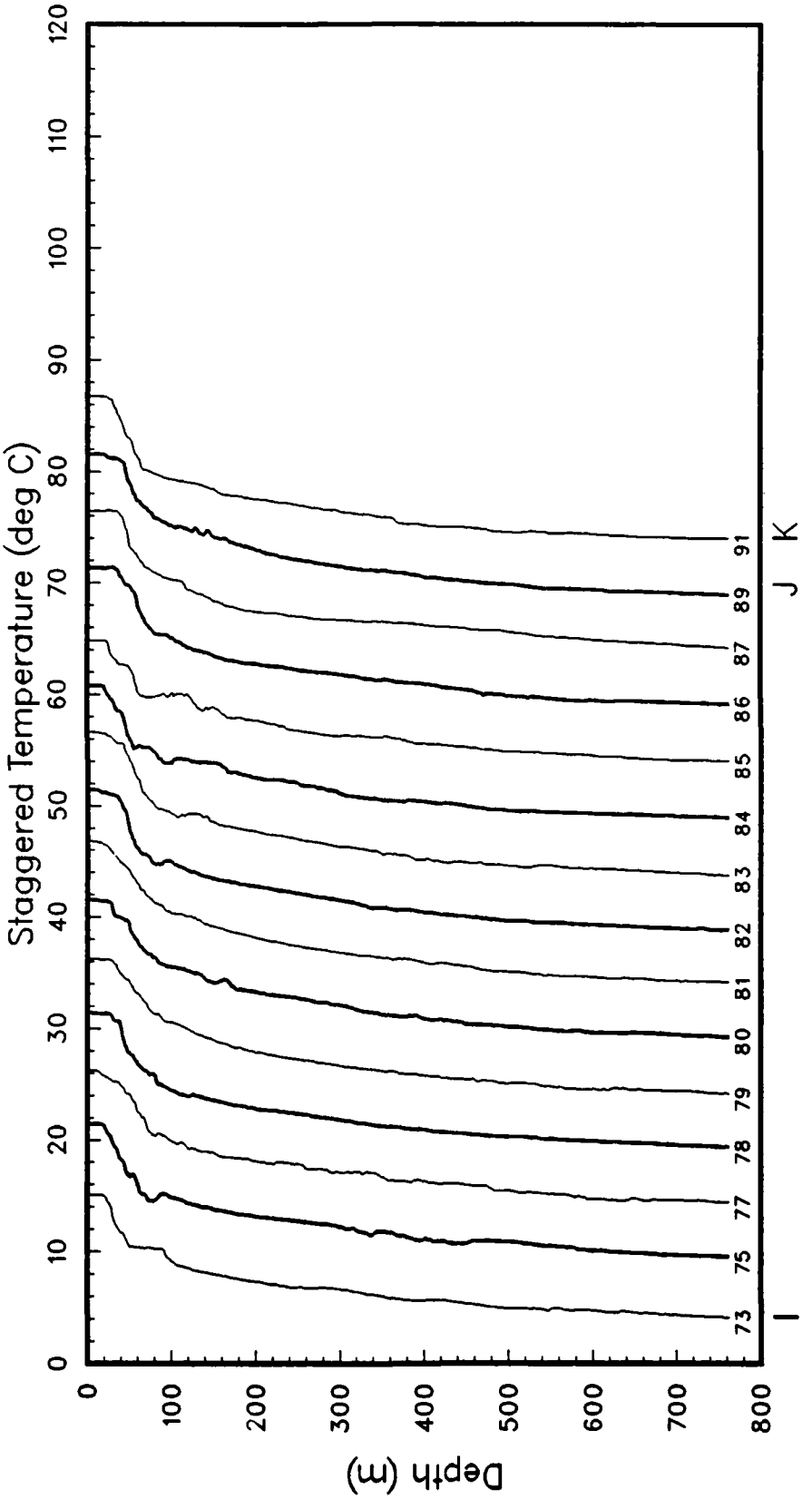

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
73
75
77
78
79
80
81
82
83
84
85
86
87
89
91
I
J
K

Figure 22(e)

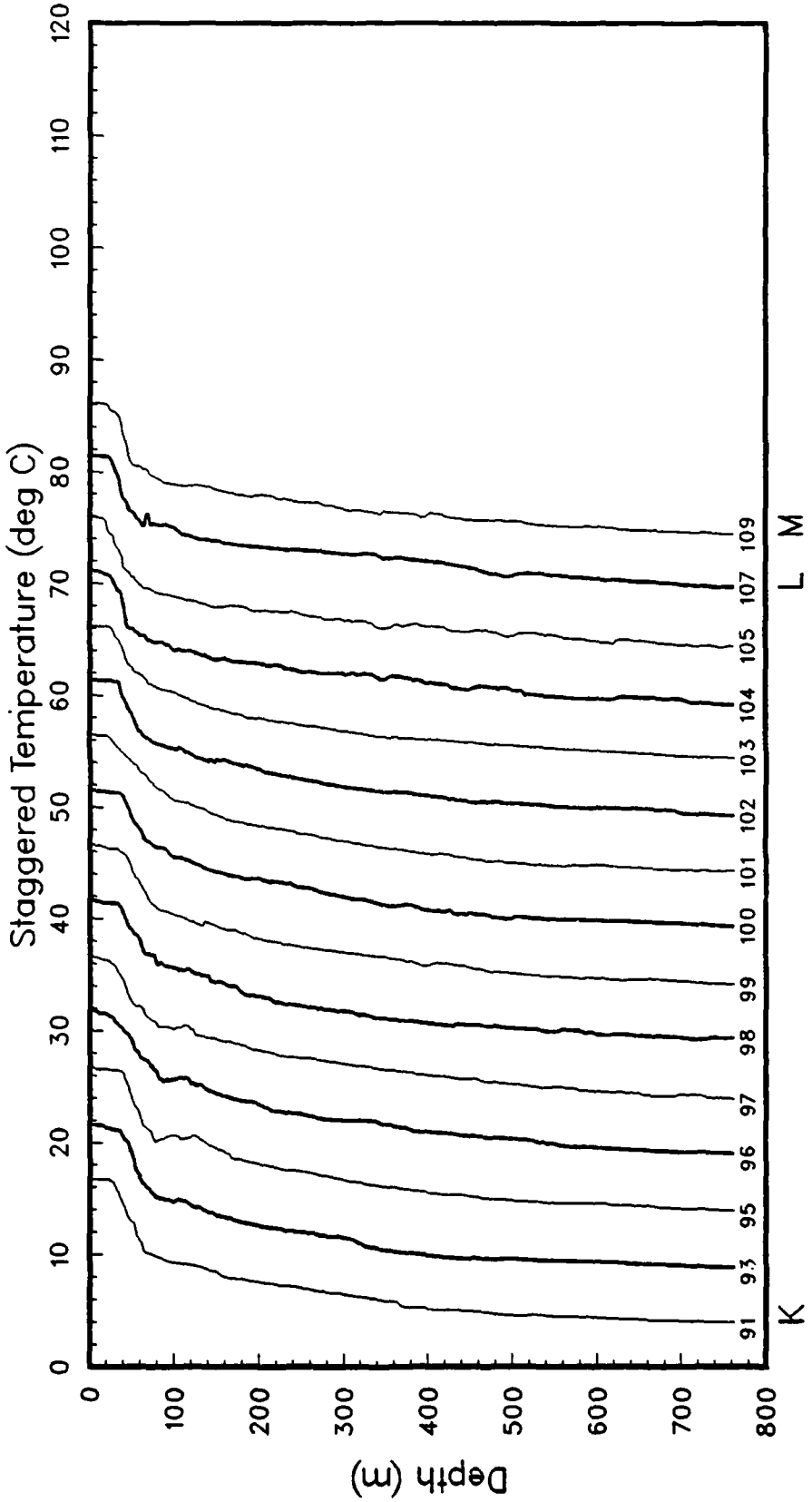
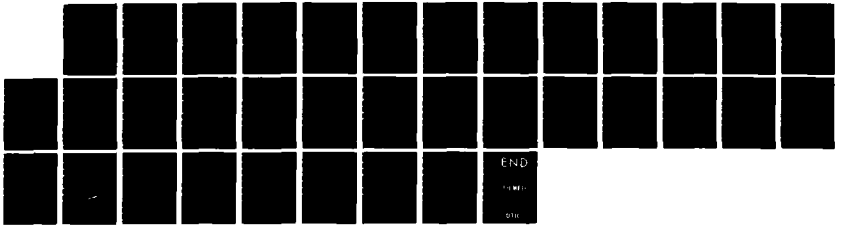
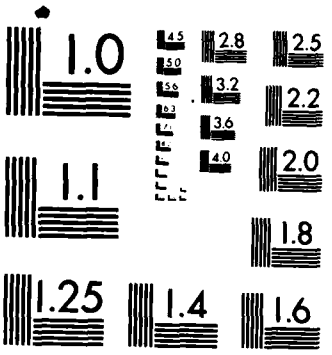

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
91
93
95
96
97
98
99
100
101
102
103
104
105
107
109
K
L
M

Figure 22(f)

AD-A162 067 HYDROGRAPHIC DATA FROM THE OPTOMA PROGRAM OPTOMA17: 2/2
OPTOMA17 P 21 JULY 19 (U) NAVAL POSTGRADUATE SCHOOL
MONTEREY CA P A WITTMANN ET AL OCT 85 NPS-68-85-026
UNCLASSIFIED F/G 8/3 NL





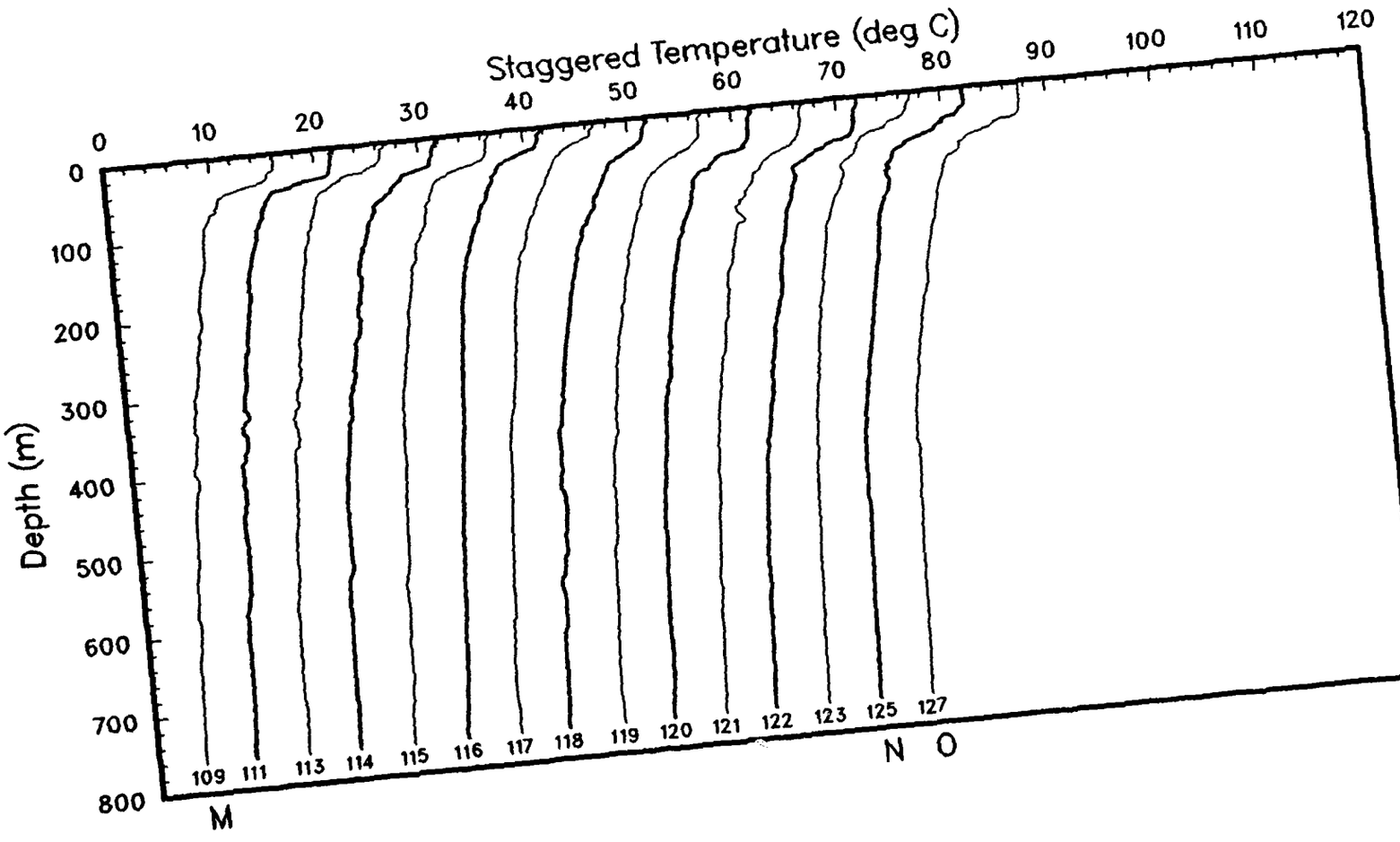

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
109
111
113
114
115
116
117
118
119
120
121
122
123
125
127
M
N
O

Figure 22(g)

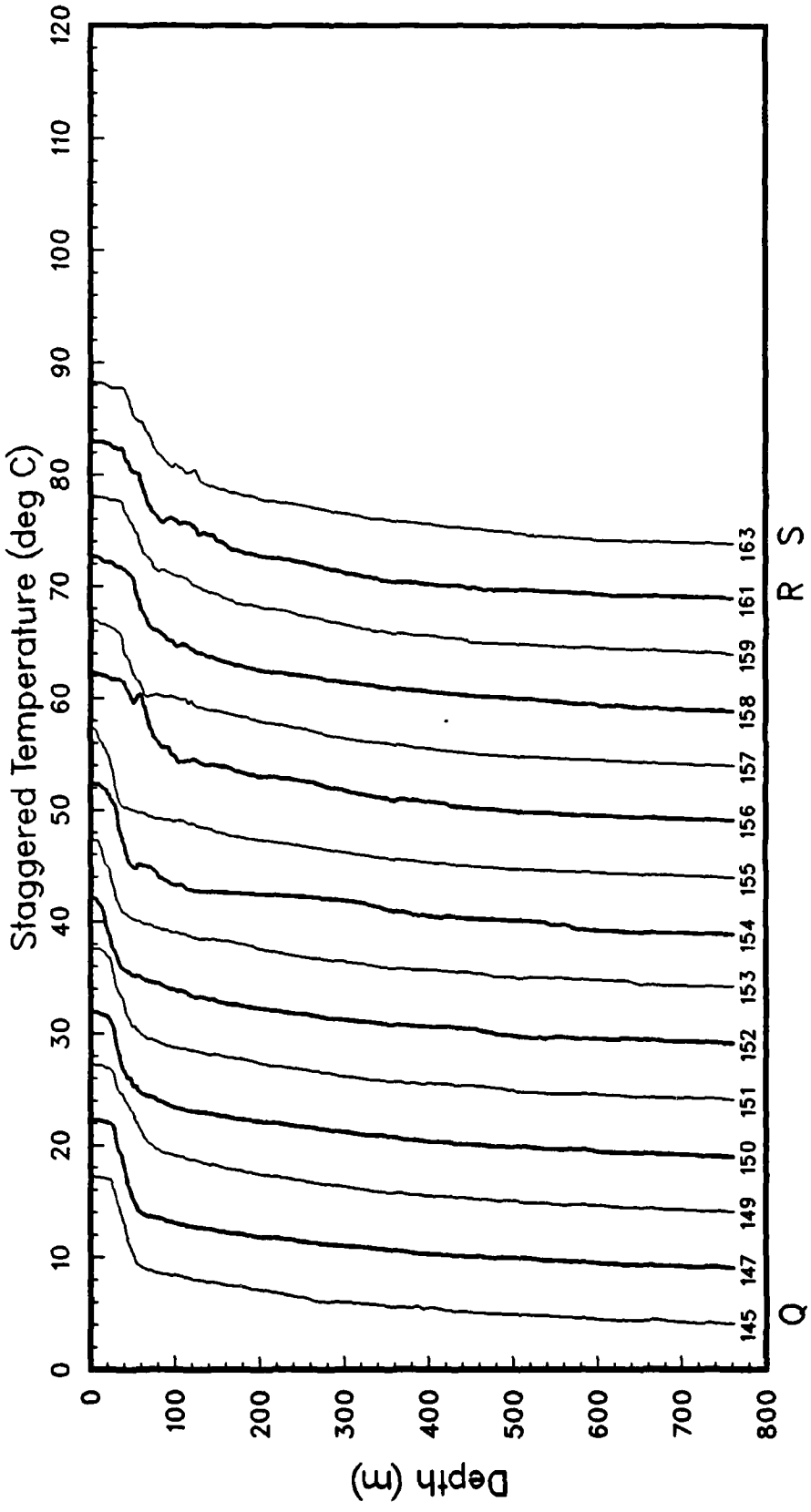

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
Q
145
147
149
150
151
152
153
154
155
156
157
158
159
161
163
R S

Figure 22(i)

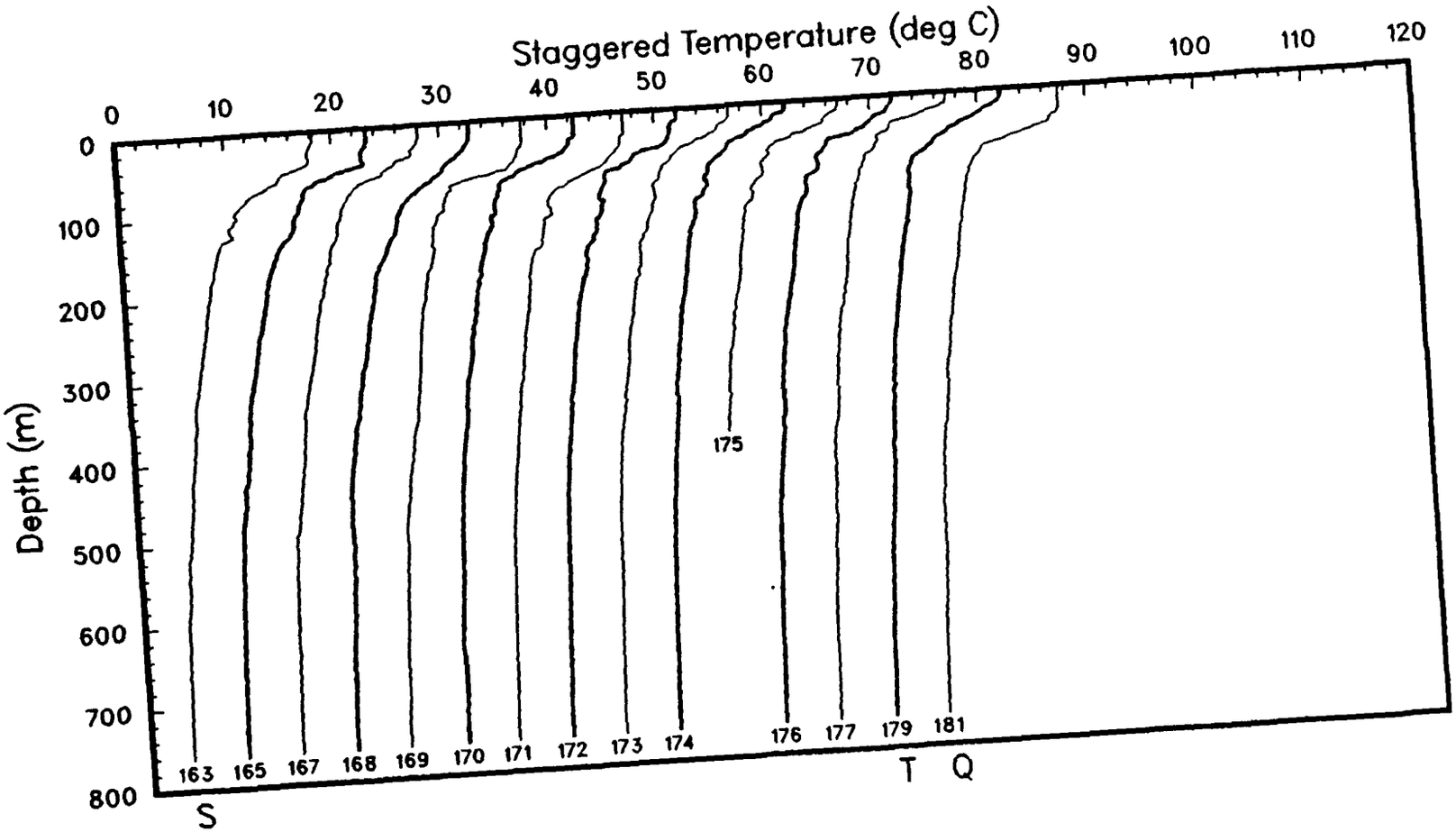

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
163
165
167
168
169
170
171
172
173
174
175
176
177
179
181
S
T
Q

Figure 22(j)

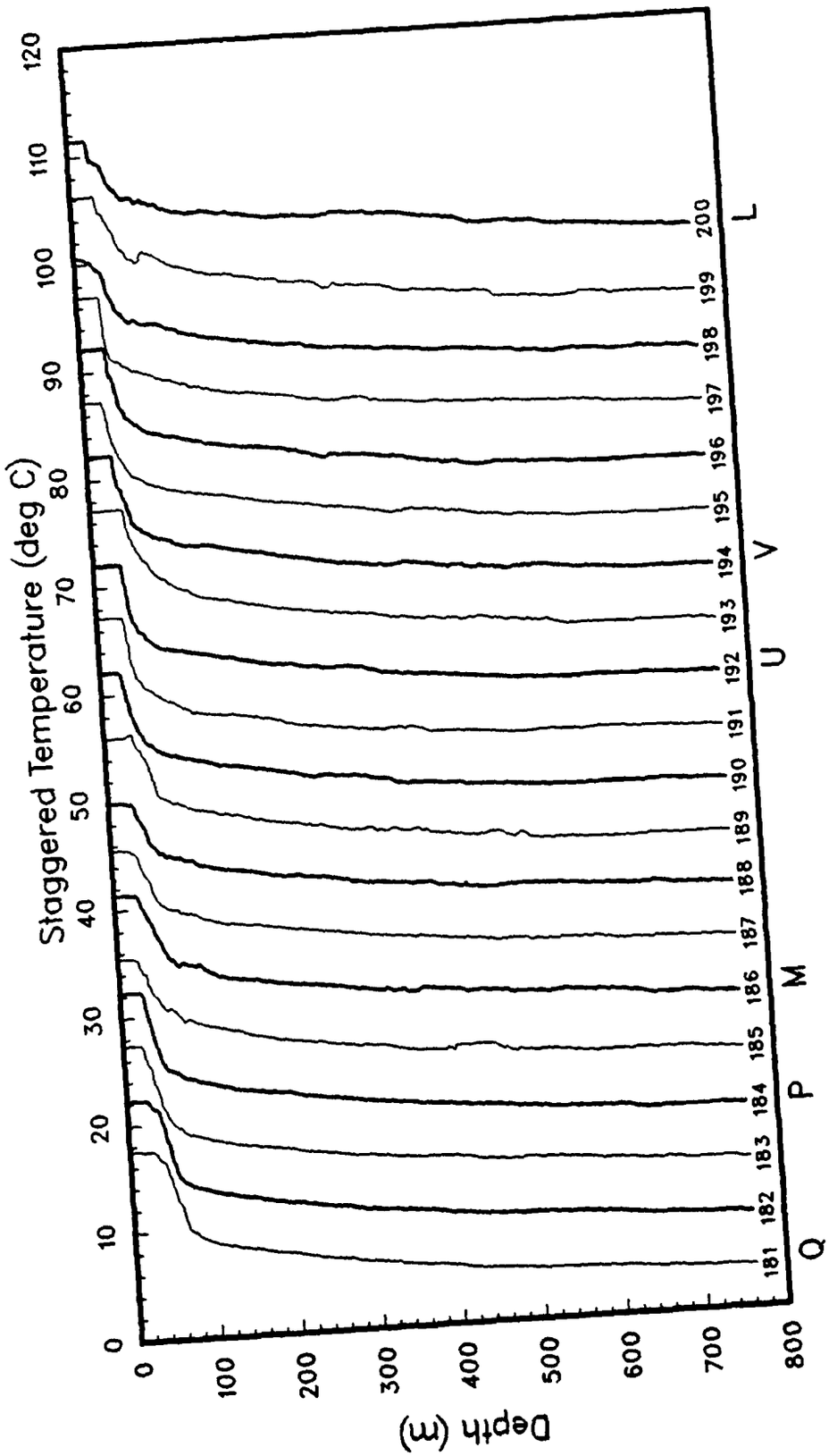

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
Q
P
M
U
V
L

Figure 22(k)

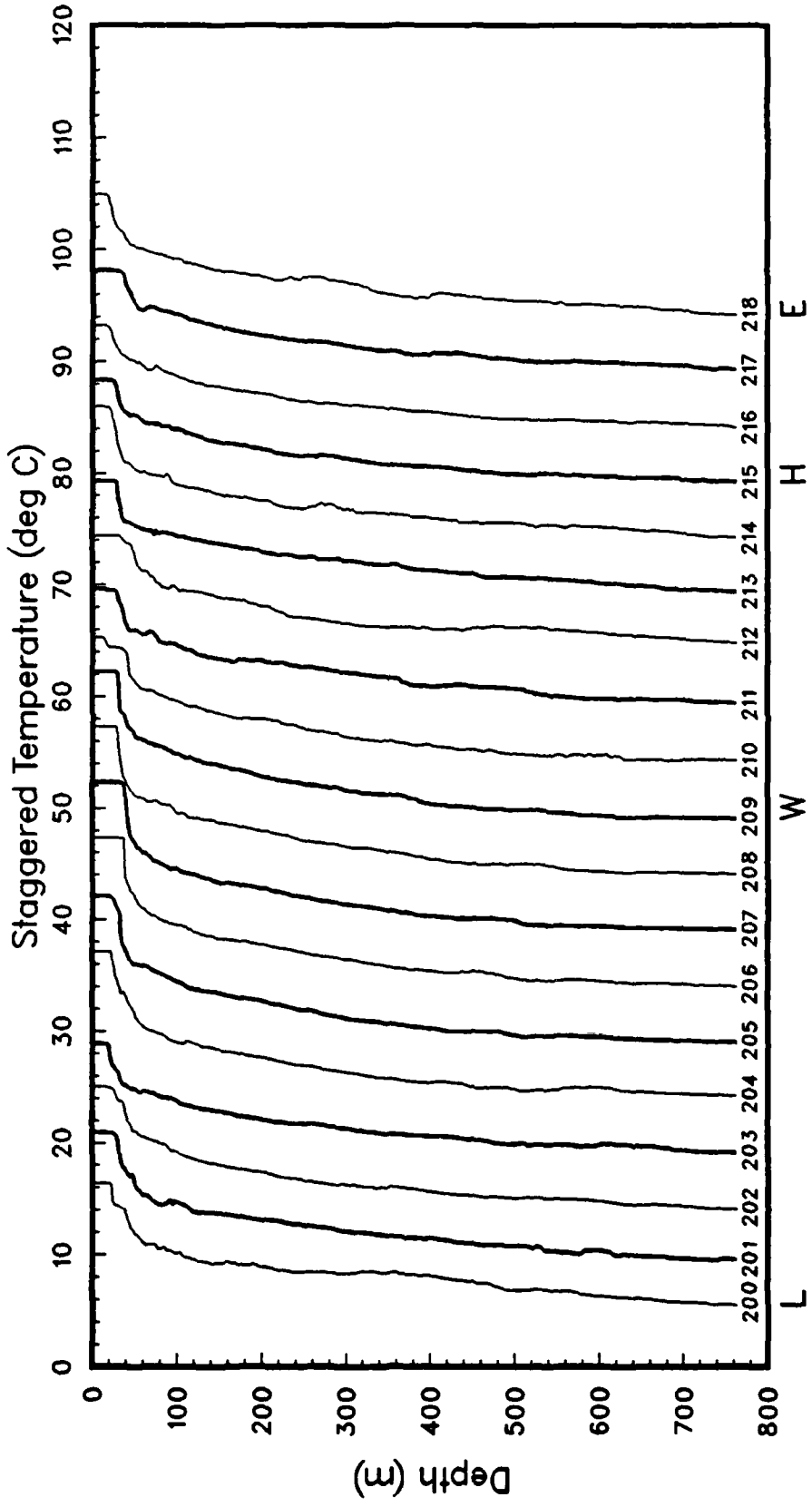

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218
L
W
H
E

Figure 22(1)

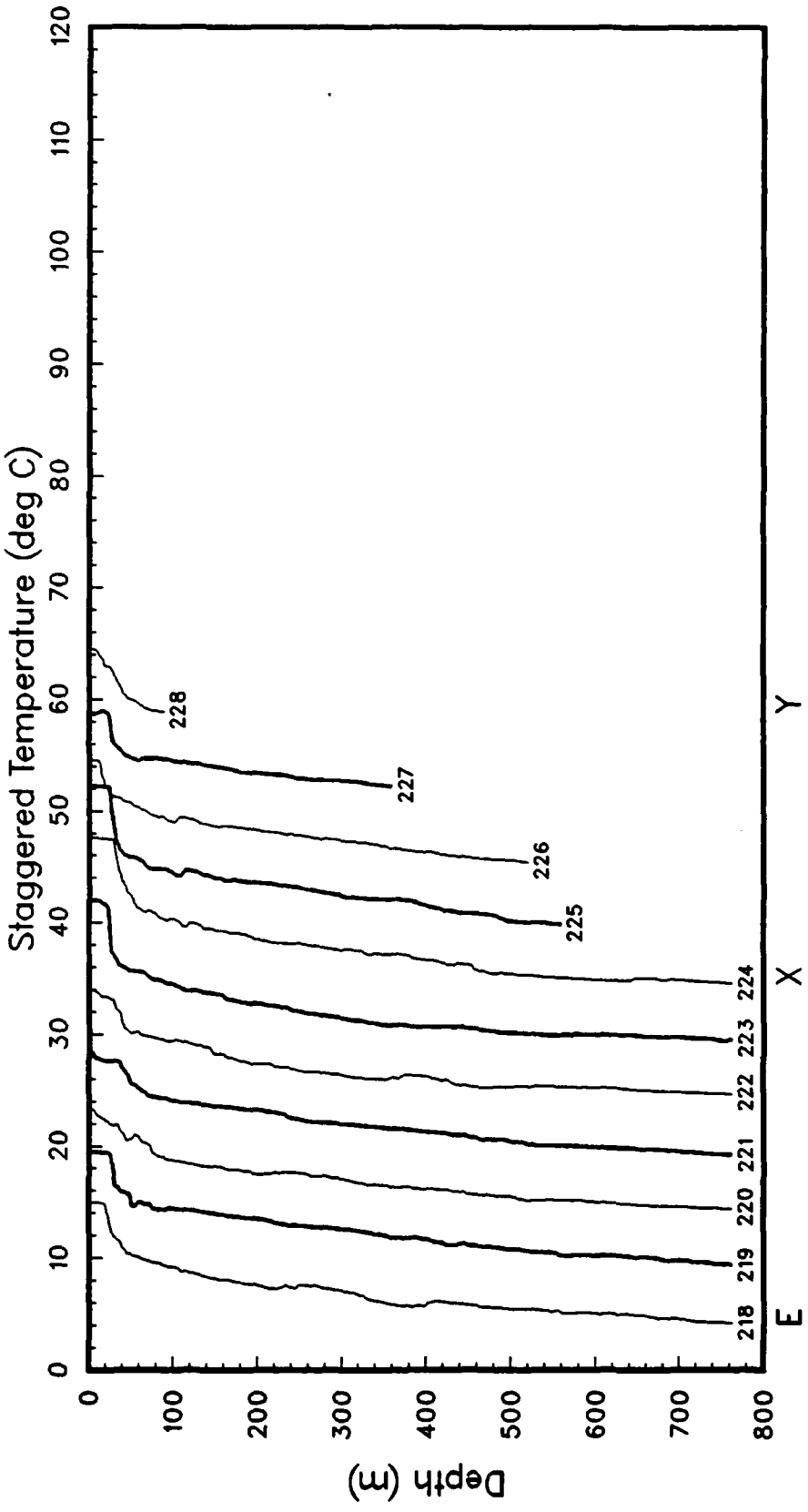

Staggered Temperature (deg C)
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (m)
0
100
200
300
400
500
600
700
800
218
219
220
221
222
223
224
225
226
227
228
E
X
Y

Figure 22(m)

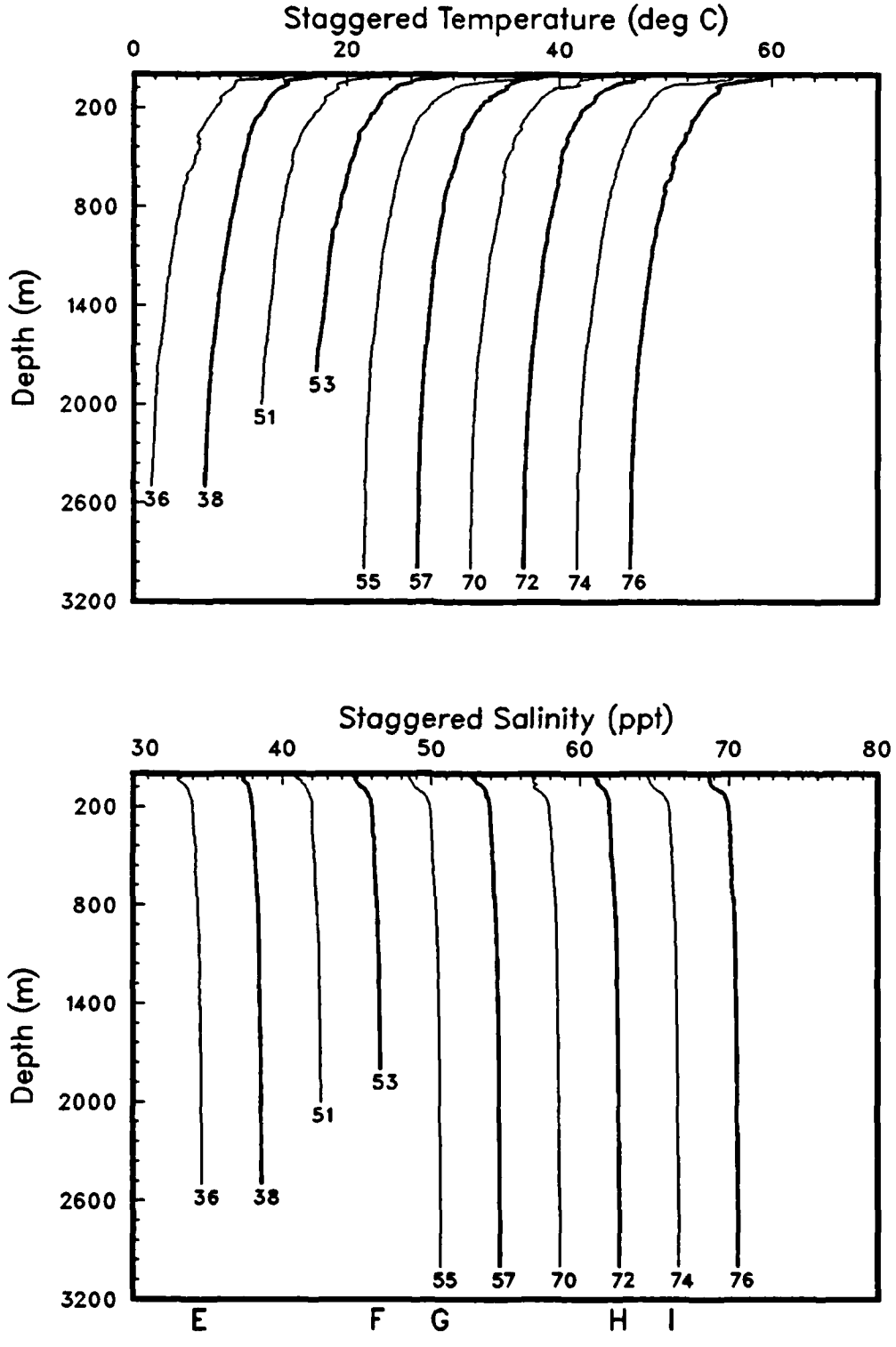


Figure 23(a): CTD temperature profiles, staggered by multiples of 5C, and salinity profiles staggered by multiples of 4 ppt (OPTOMA17, Leg DII).

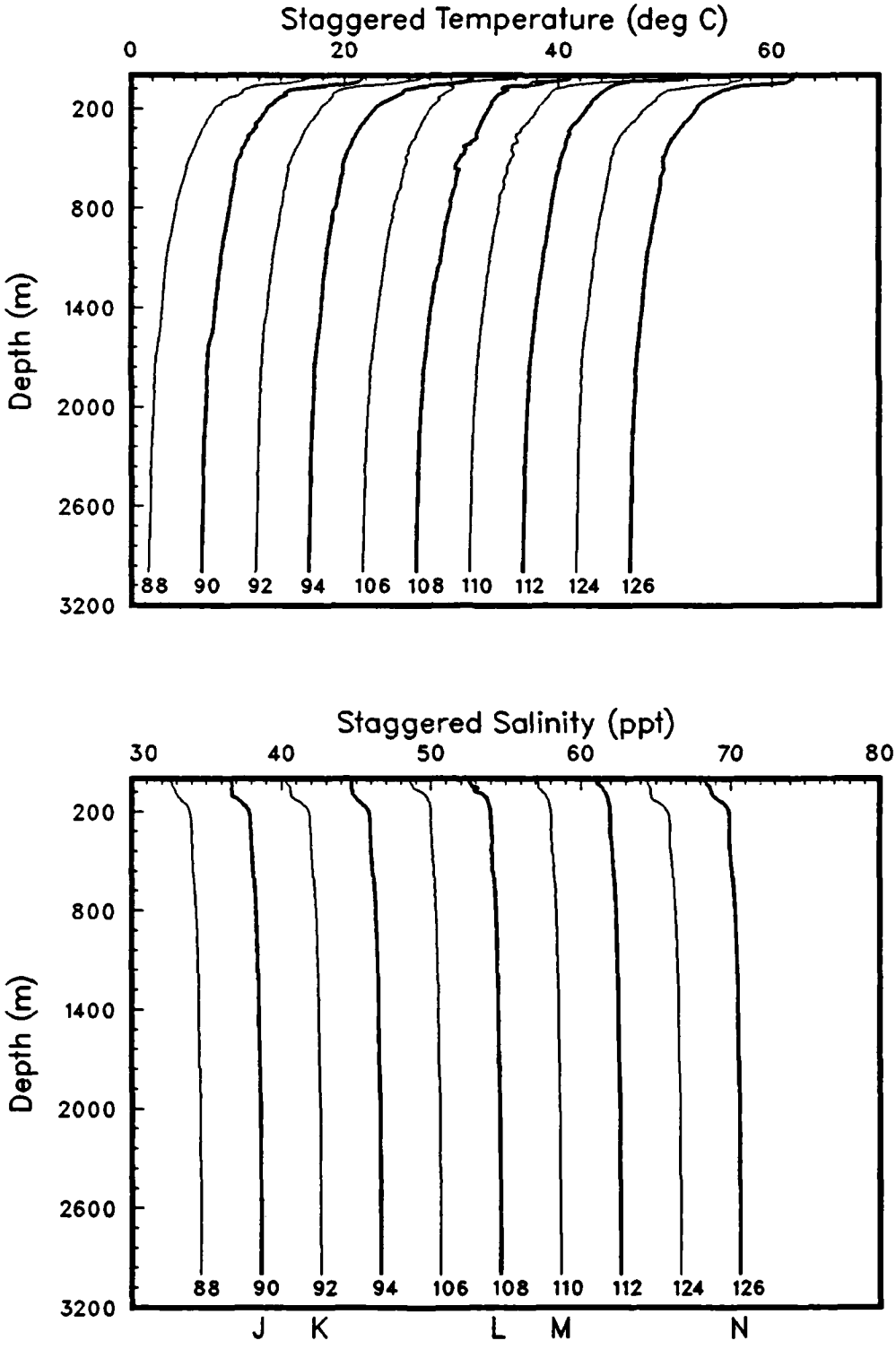

Staggered Temperature (deg C)
0
20
40
60
Depth (m)
200
800
1400
2000
2600
3200
88
90
92
94
106
108
110
112
124
126
Staggered Salinity (ppt)
30
40
50
60
70
80
Depth (m)
200
800
1400
2000
2600
3200
88
90
92
94
106
108
110
112
124
126
J
K
L
M
N

Figure 23(b)

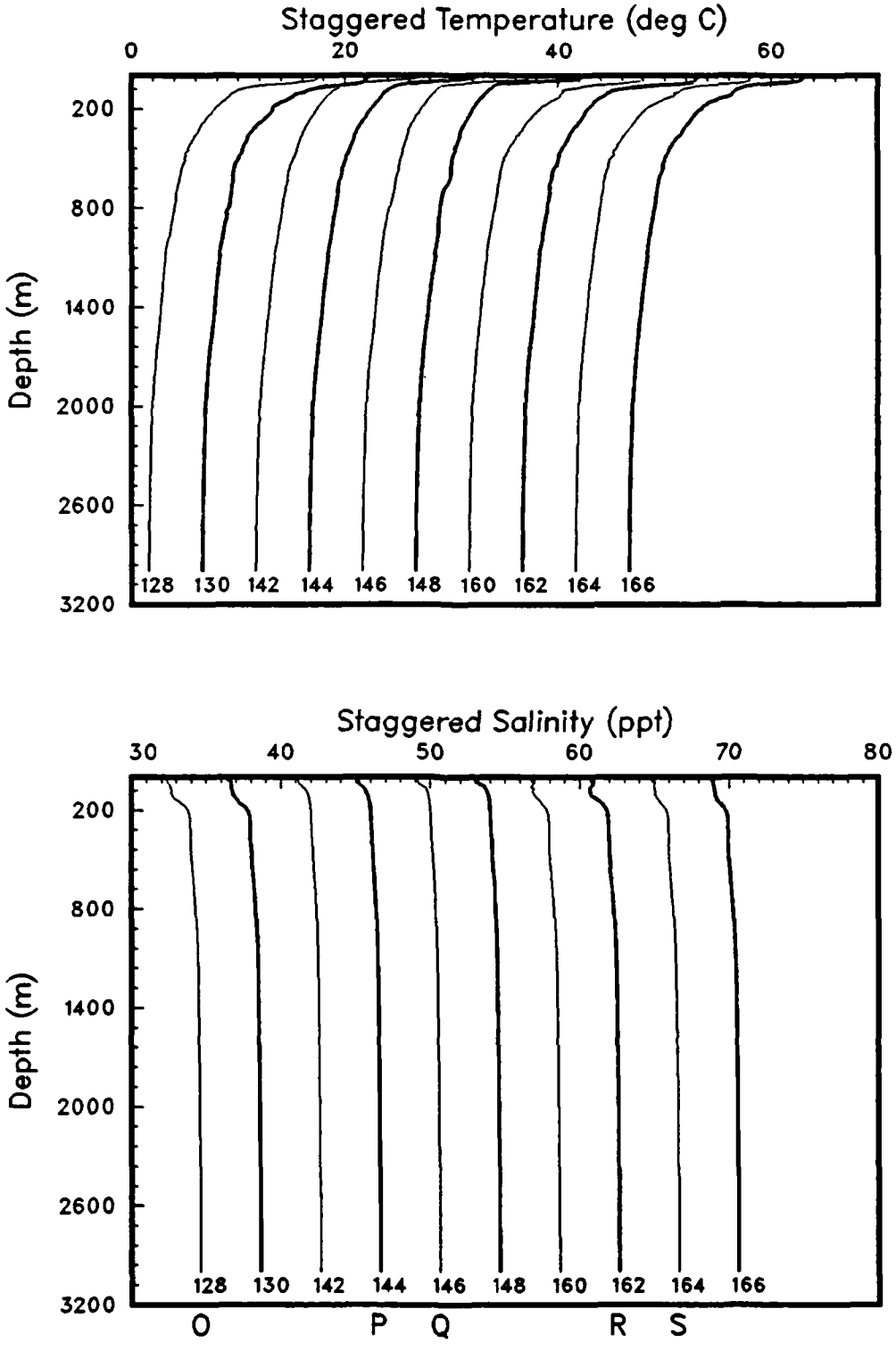

Staggered Temperature (deg C)
0
20
40
60
Depth (m)
200
800
1400
2000
2600
3200
128 130 142 144 146 148 160 162 164 166
Staggered Salinity (ppt)
30
40
50
60
70
80
Depth (m)
200
800
1400
2000
2600
3200
128 130 142 144 146 148 160 162 164 166
O
P
Q
R
S

Figure 23(c)

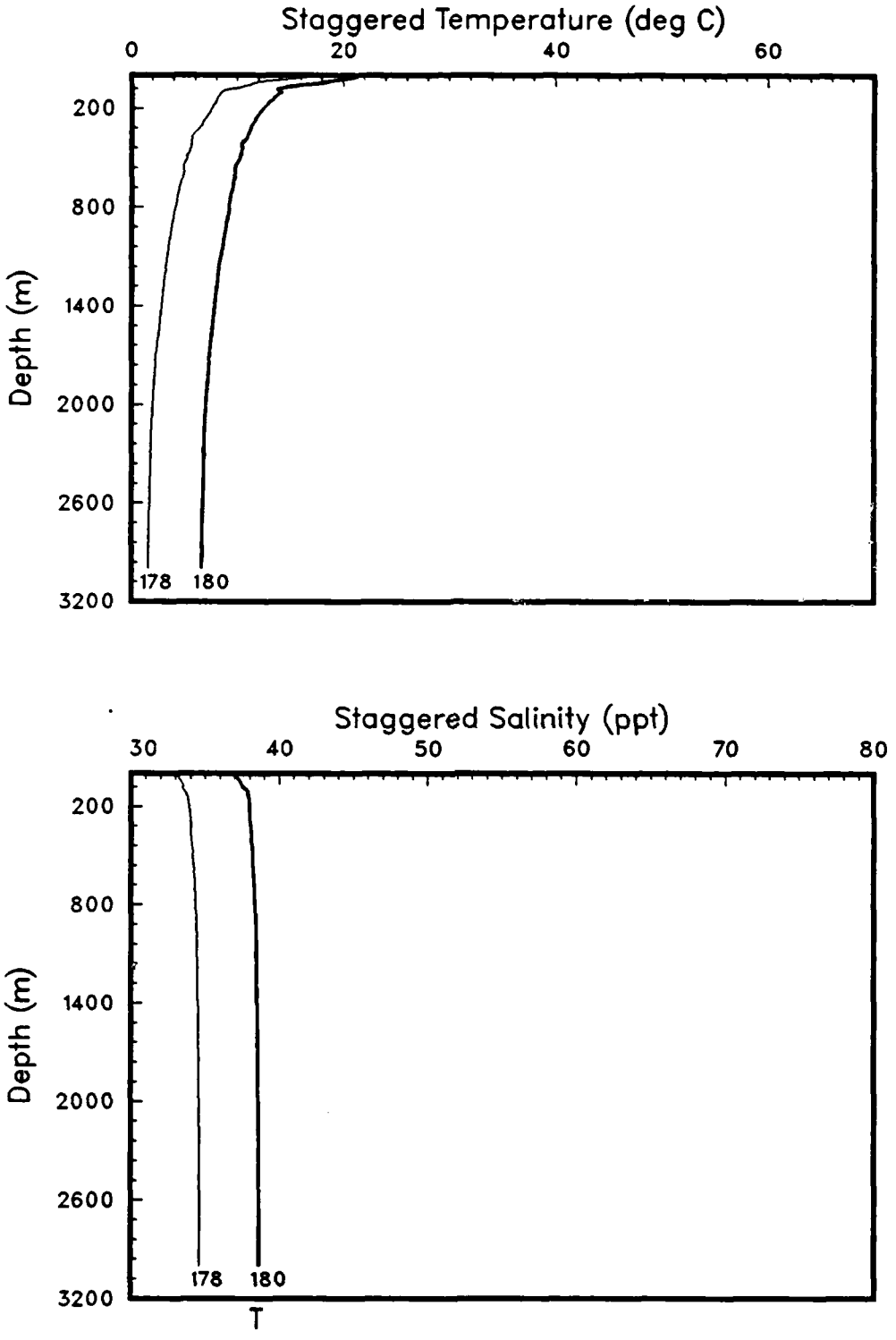

Staggered Temperature (deg C)
0
20
40
60
200
800
1400
2000
2600
3200
Depth (m)
178
180
Staggered Salinity (ppt)
30
40
50
60
70
80
200
800
1400
2000
2600
3200
Depth (m)
178
180
T

Figure 23(d)

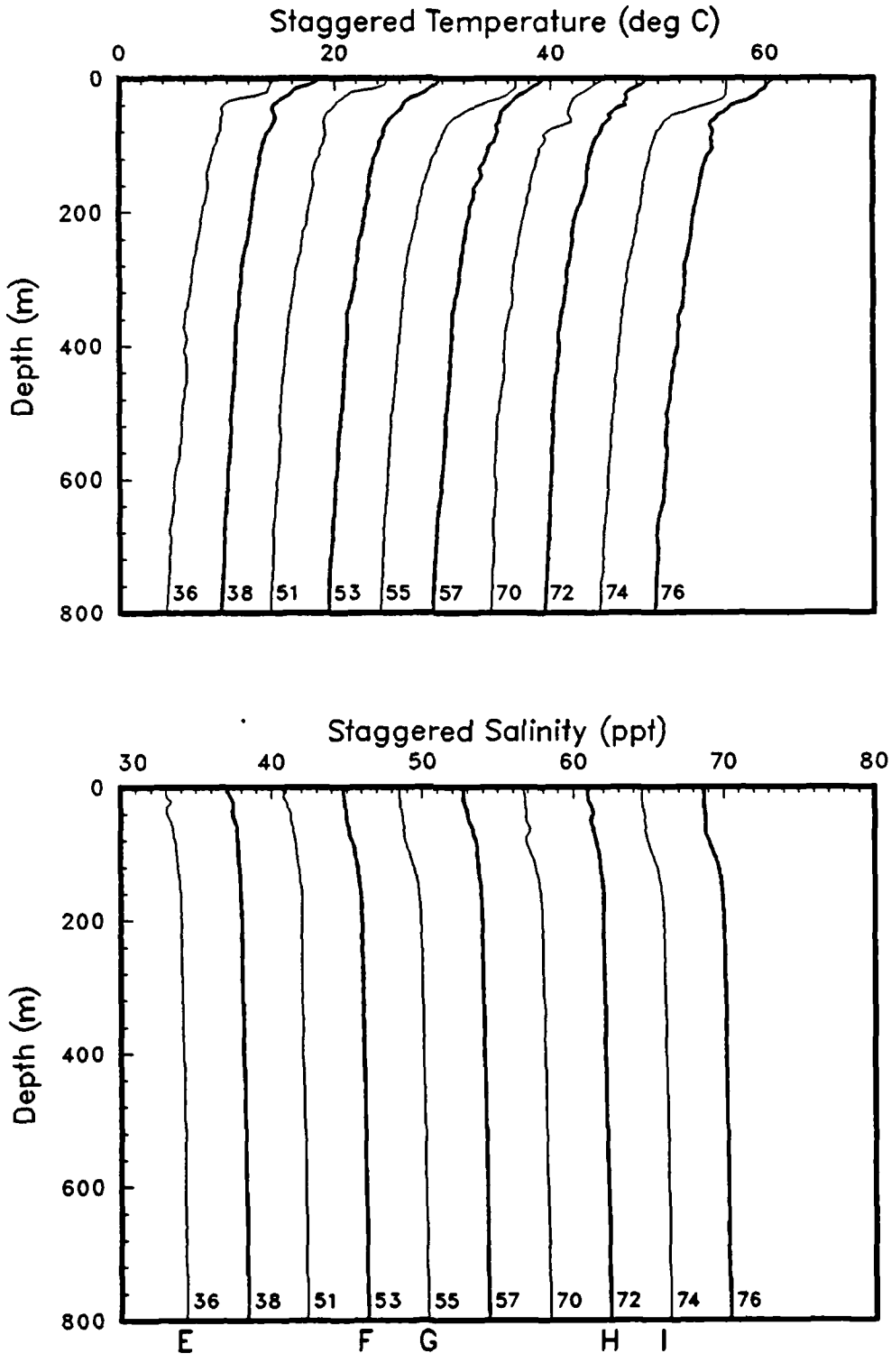


Figure 24(a): Casts: Surface to 800m (OPTOMA17, Leg DII).

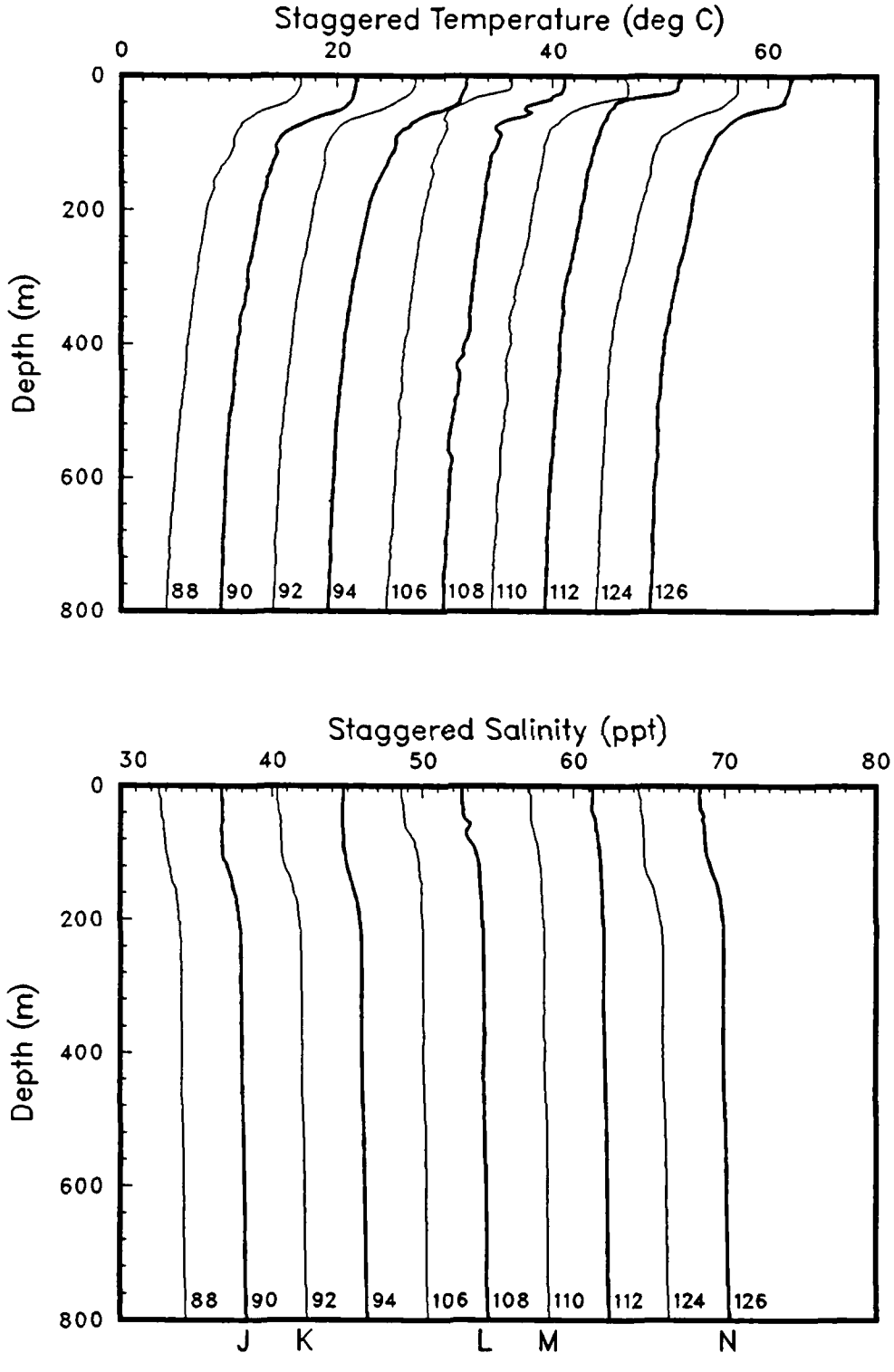

Staggered Temperature (deg C)
0
20
40
60
0
200
400
600
800
Depth (m)
88
90
92
94
106
108
110
112
124
126
Staggered Salinity (ppt)
30
40
50
60
70
80
0
200
400
600
800
Depth (m)
88
90
92
94
106
108
110
112
124
126
J
K
L
M
N

Figure 24(b)

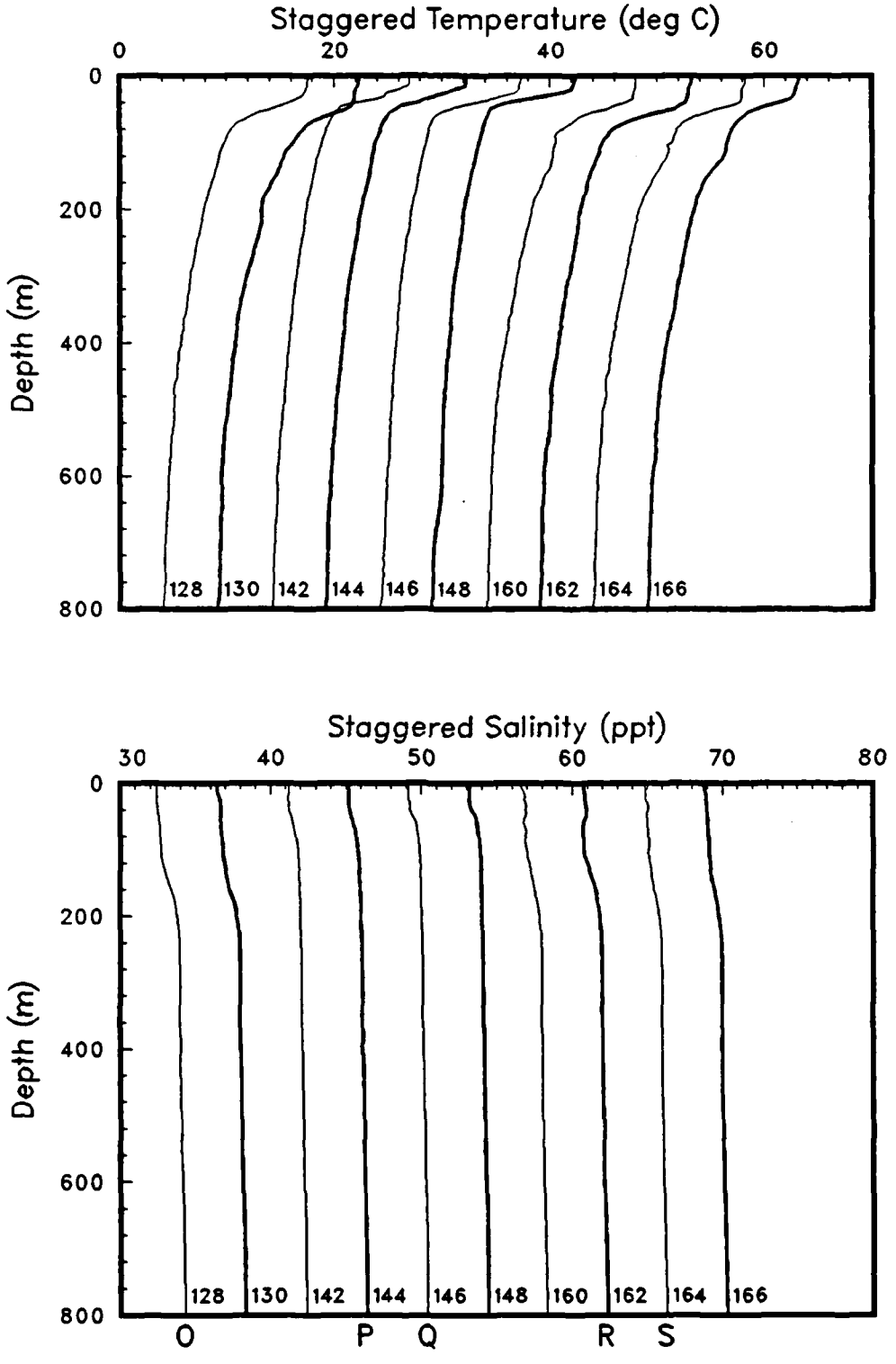

Staggered Temperature (deg C)
0
20
40
60
Depth (m)
0
200
400
600
800
128
130
142
144
146
148
160
162
164
166
Staggered Salinity (ppt)
30
40
50
60
70
80
O
P
Q
R
S

Figure 24(c)

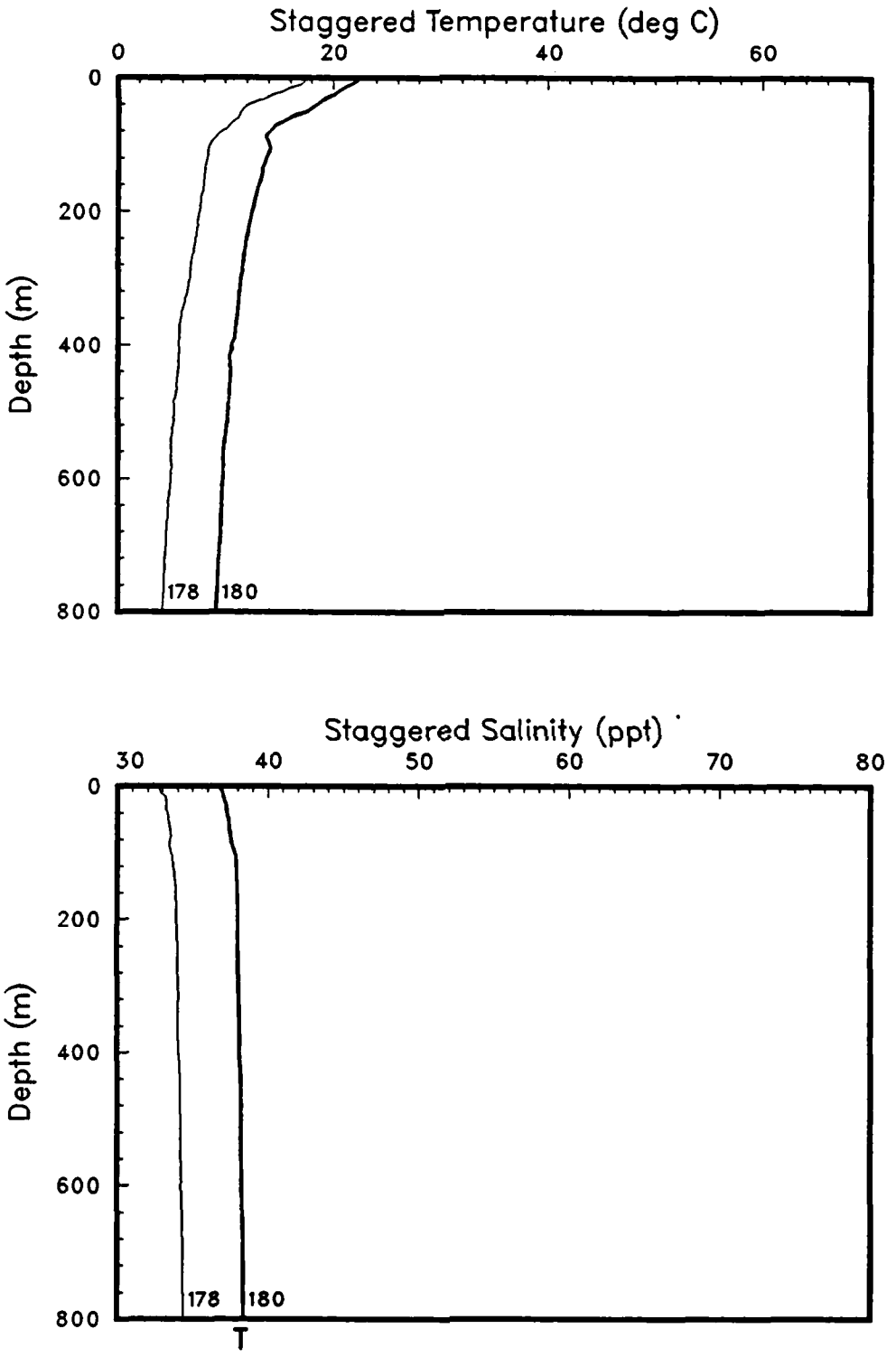

Staggered Temperature (deg C)
0
20
40
60
0
200
400
600
800
Depth (m)
178
180
Staggered Salinity (ppt)
30
40
50
60
70
80
0
200
400
600
800
Depth (m)
178
180
T

Figure 24(d)

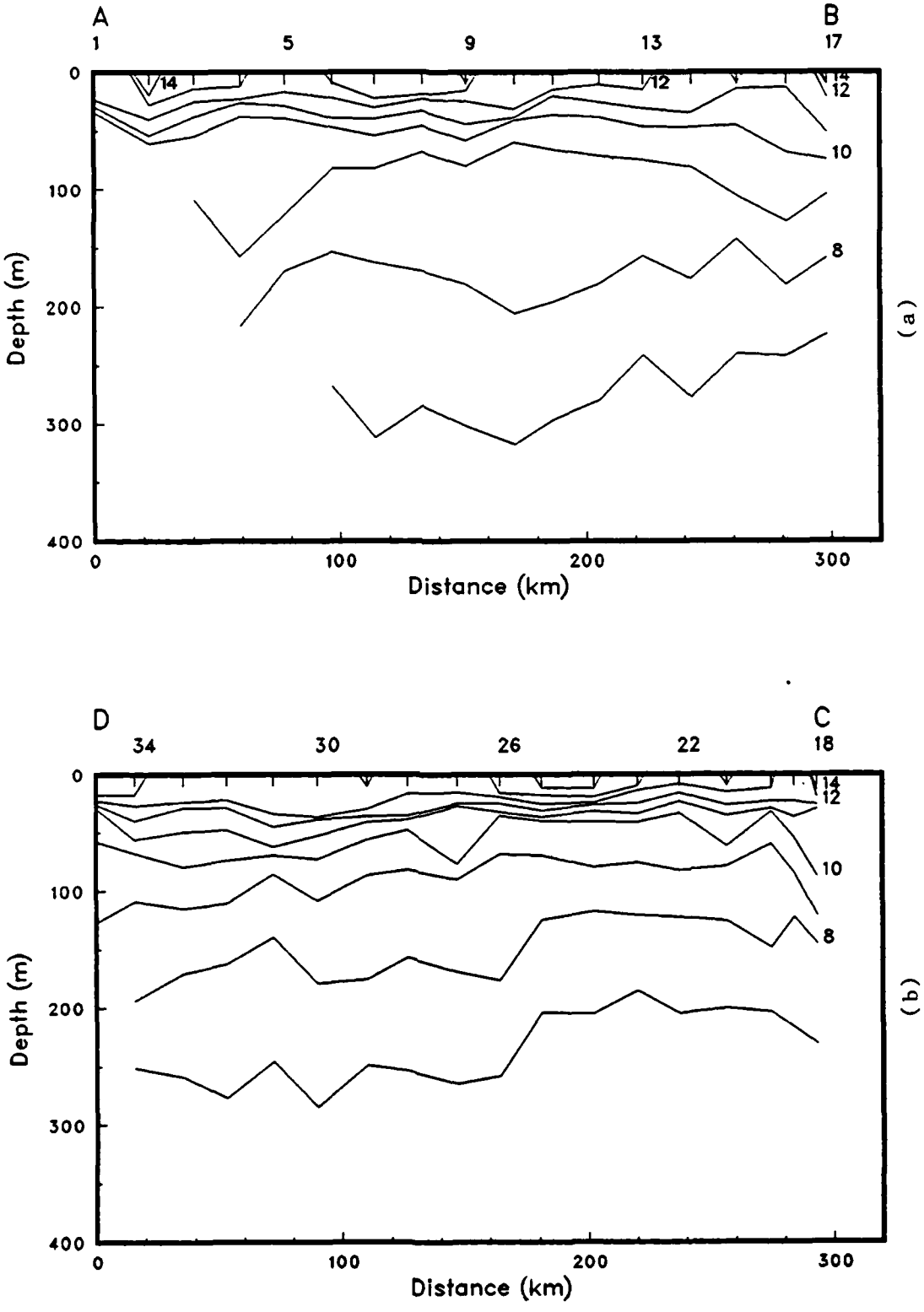


Figure 25(a)-(b): Along-track isotherms. Tick mark along the upper horizontal axis show station positions. Some station numbers are given. Dashed lines are used if the cast was too shallow (OPTOMA17, Leg DII).

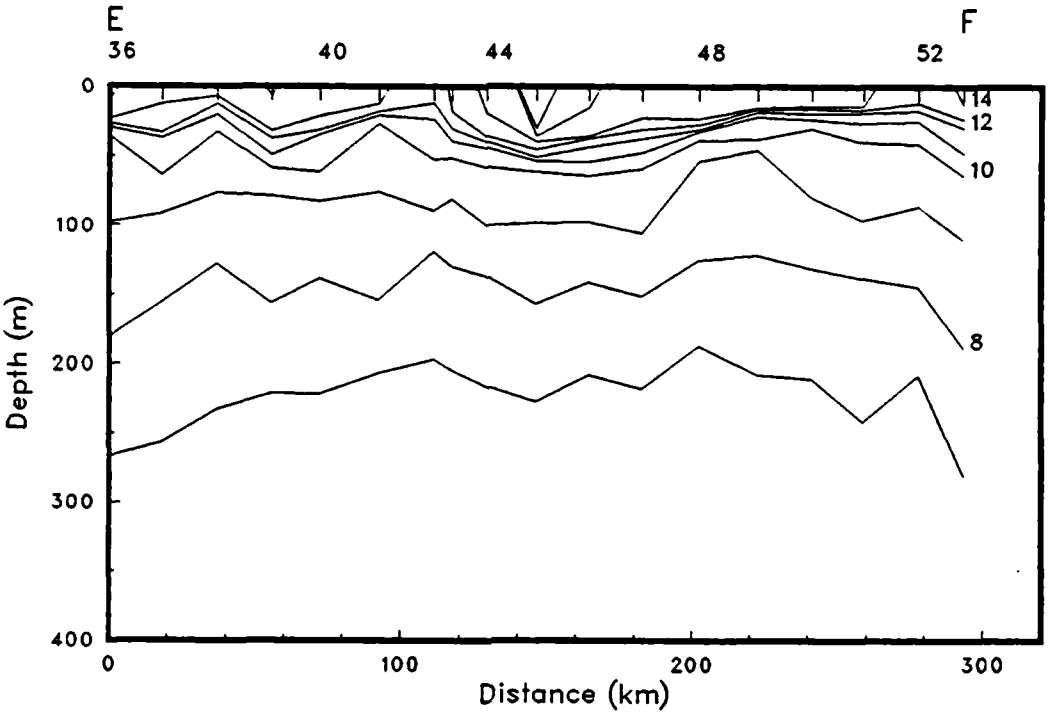


Figure 25(c)

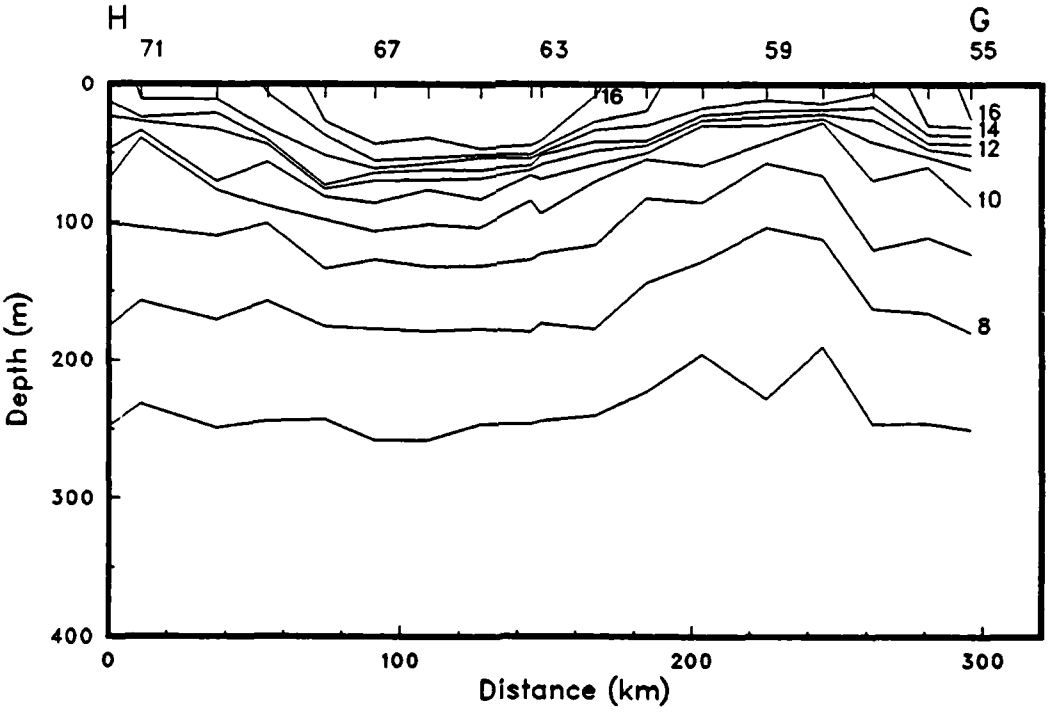


Figure 25(d)

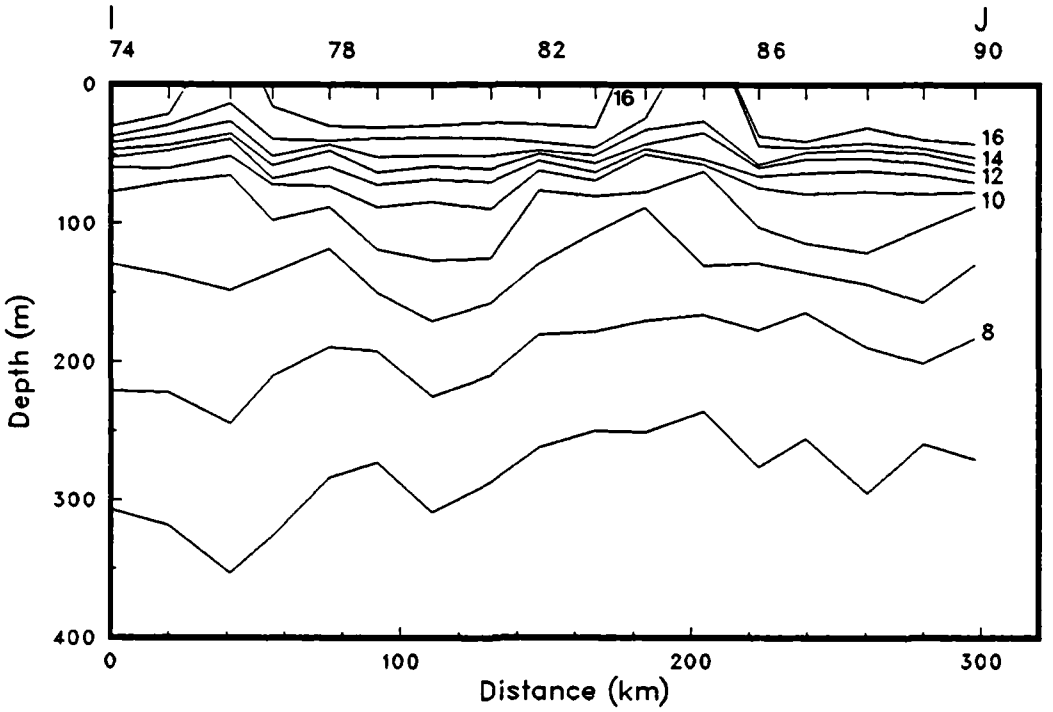


Figure 25(e)

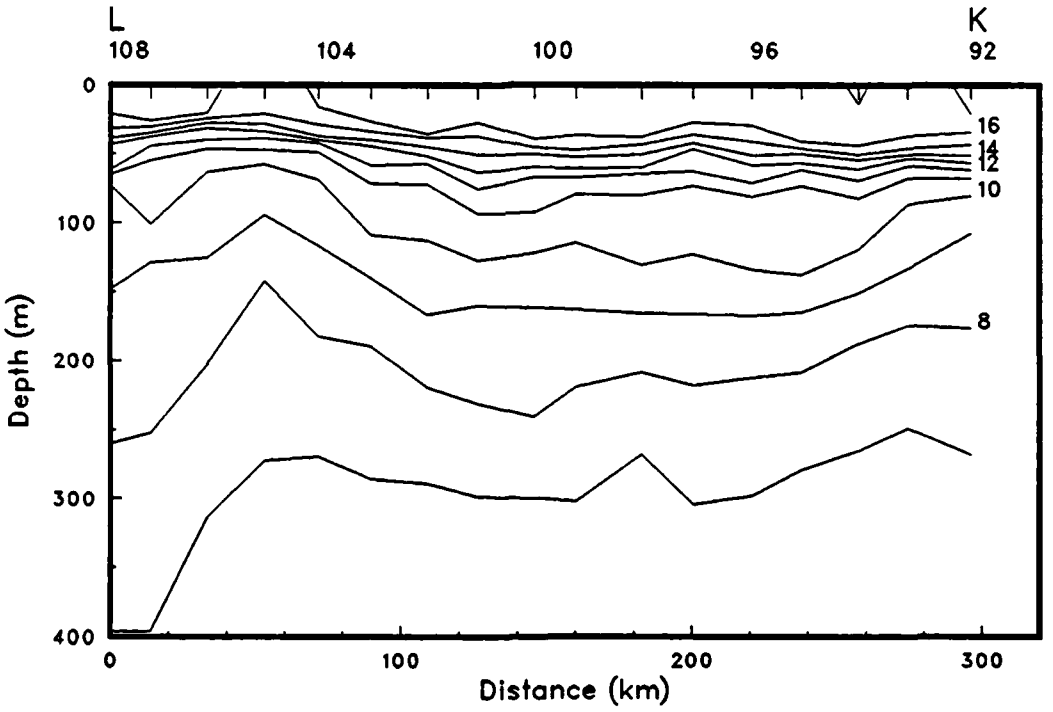


Figure 25(f)

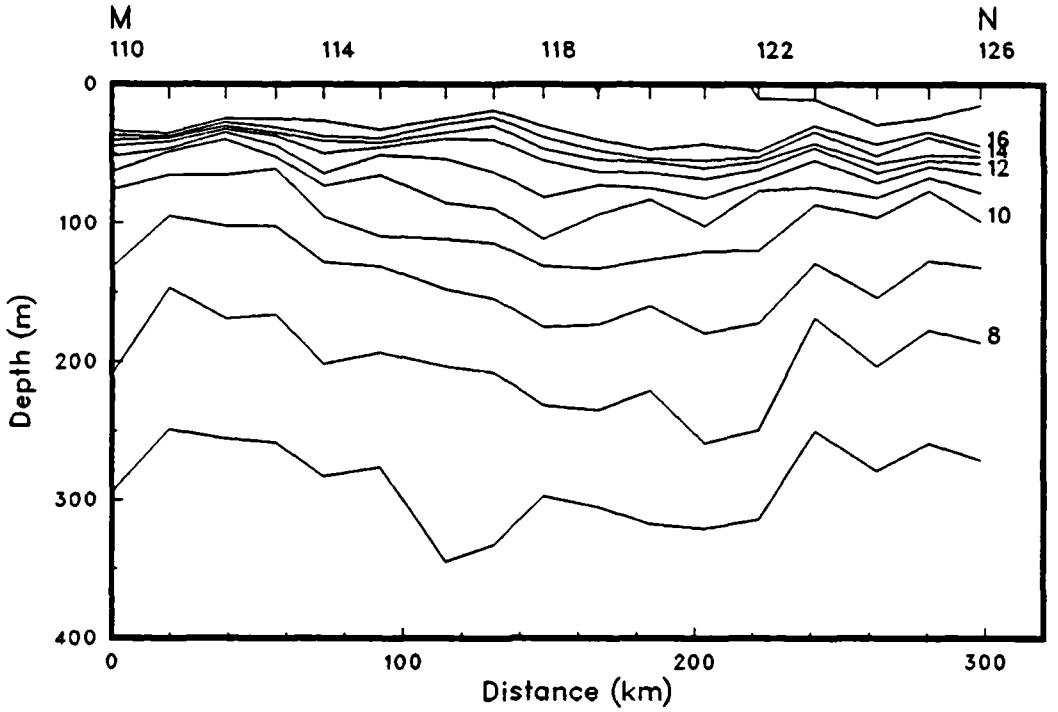


Figure 25(g)

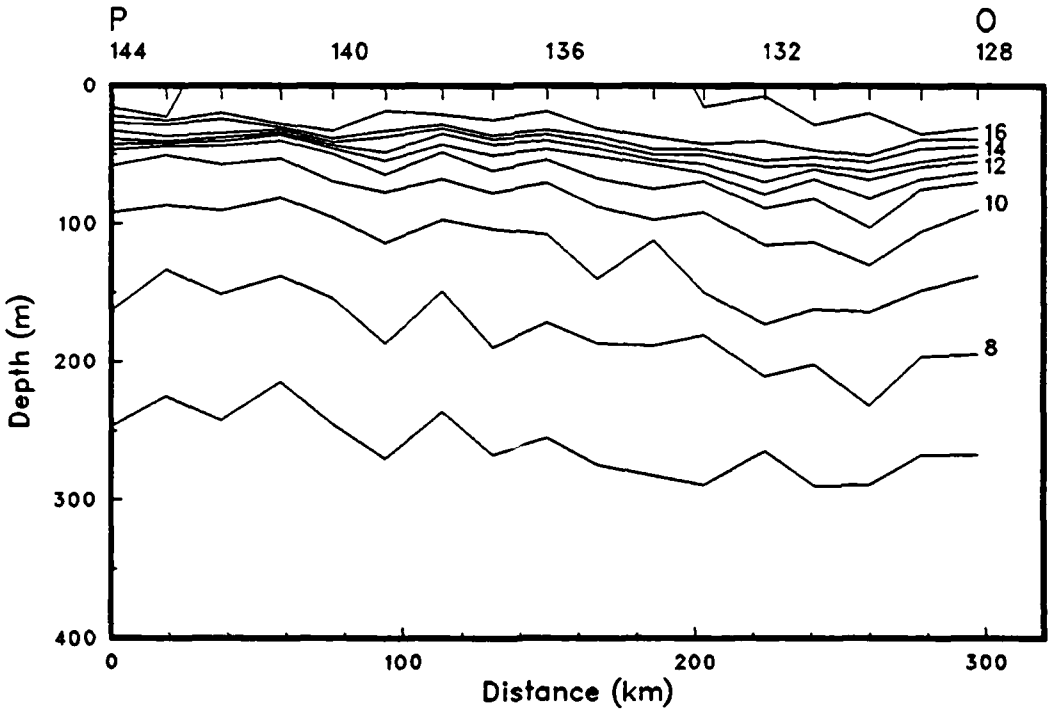


Figure 25(h)

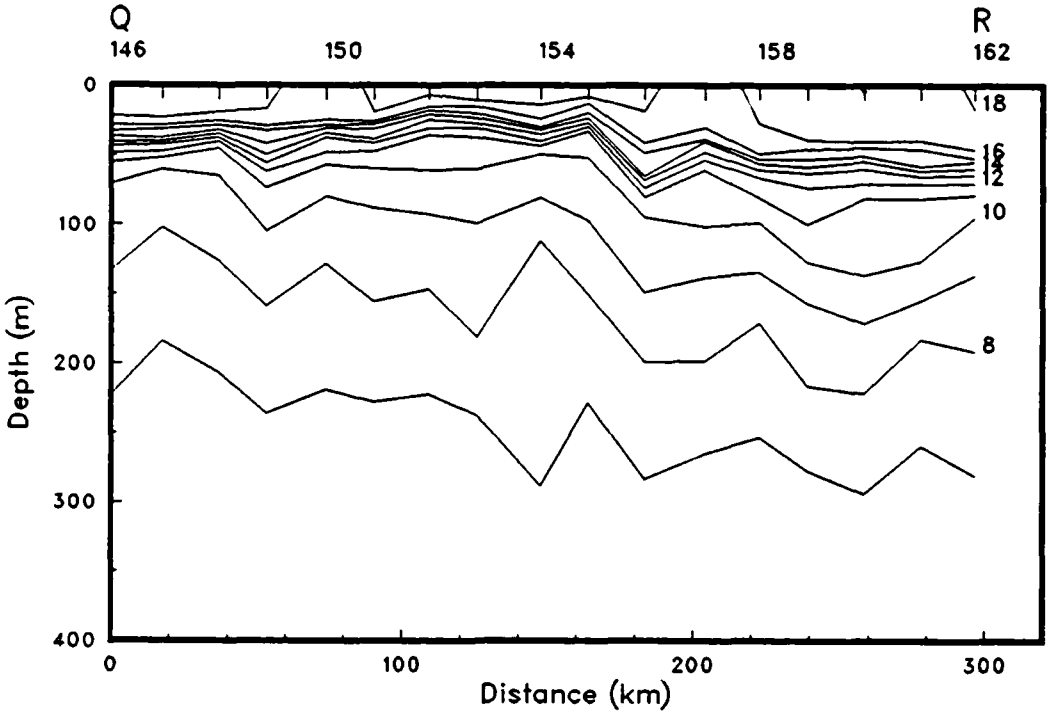


Figure 25(i)

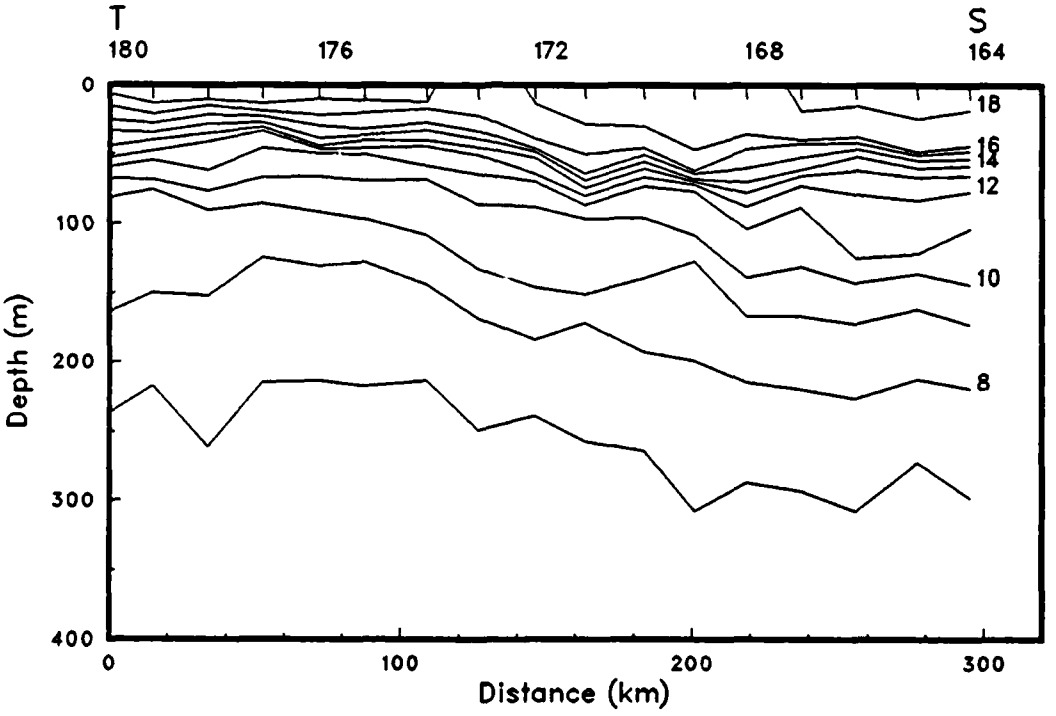


Figure 25(j)

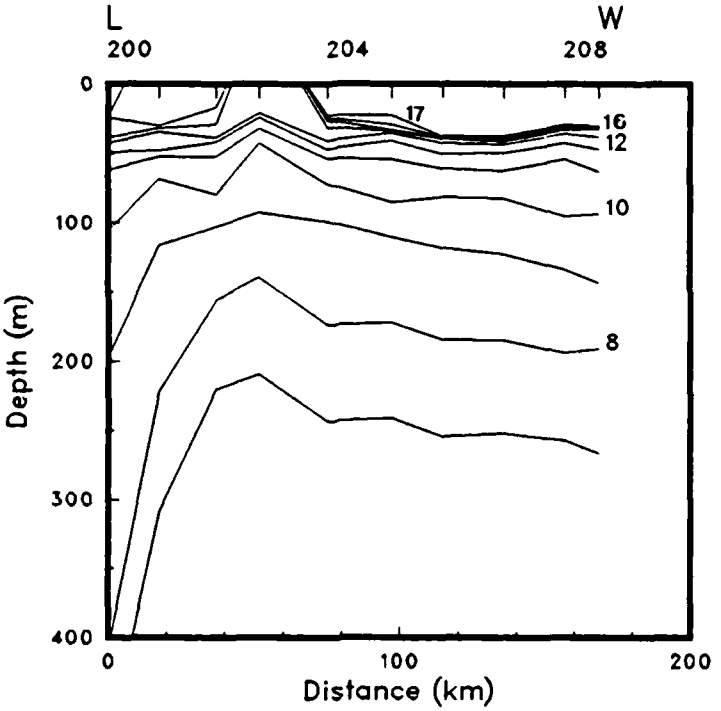


Figure 25(k)

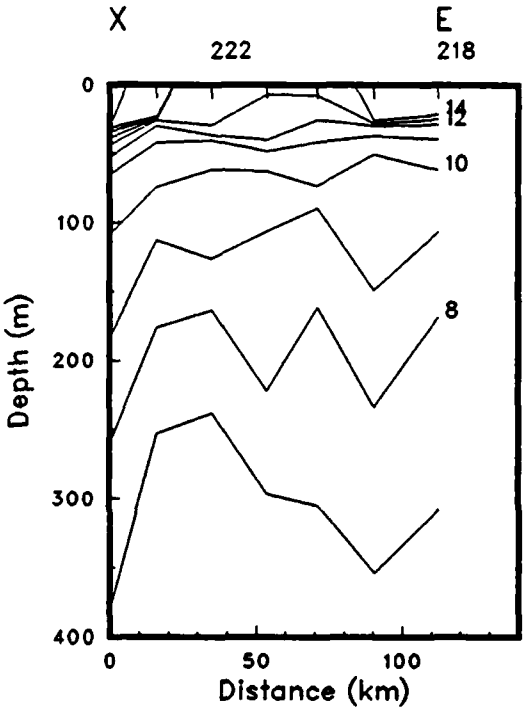


Figure 25(l)

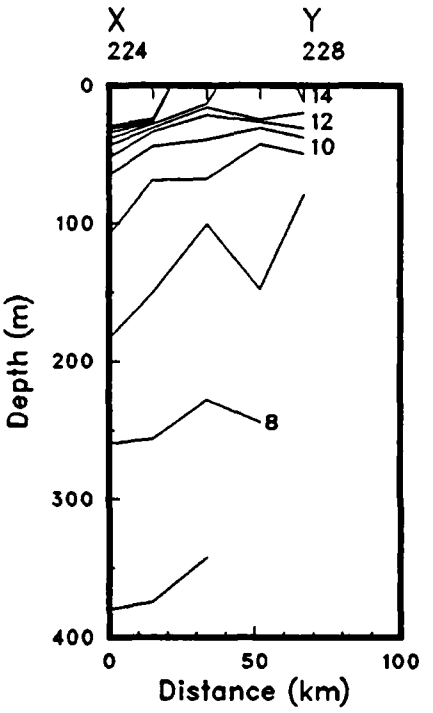


Figure 25(m)

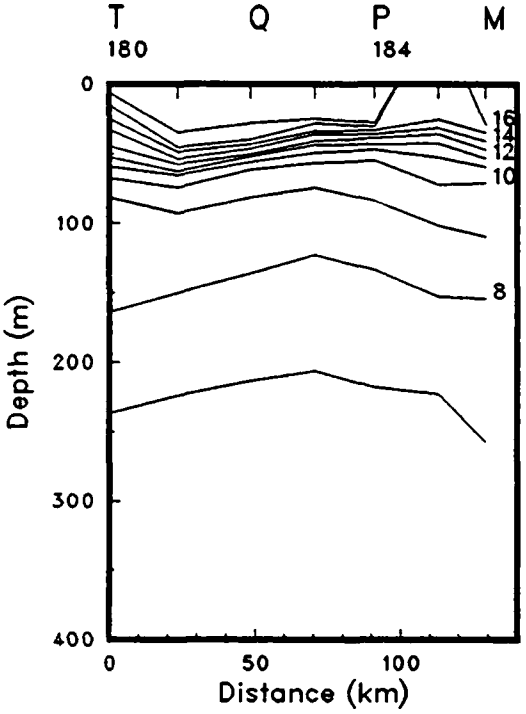


Figure 25(n)

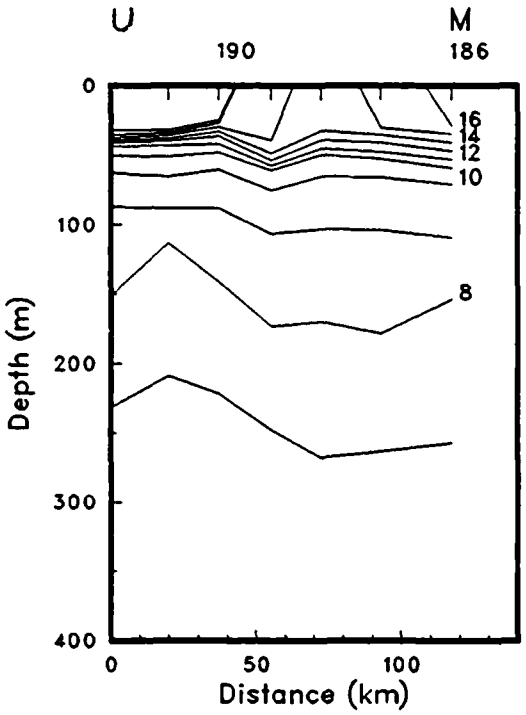


Figure 25(o)

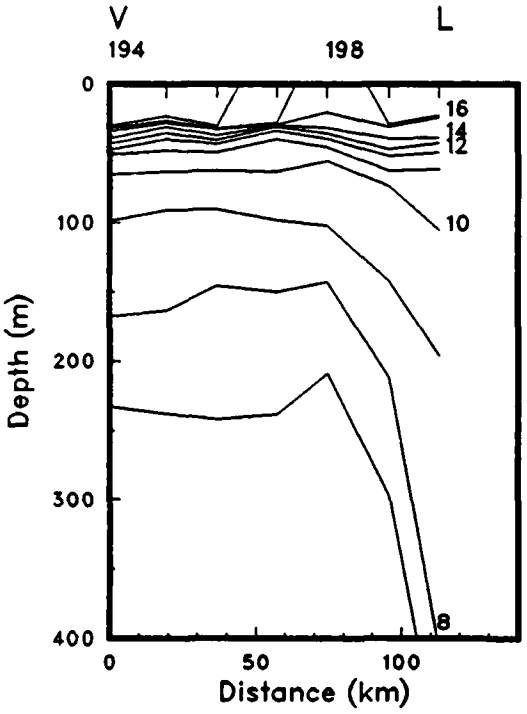


Figure 25(p)

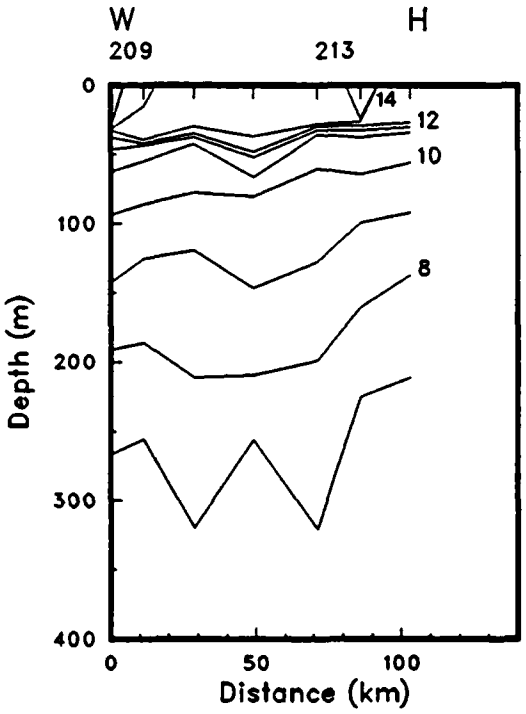


Figure 25(q)

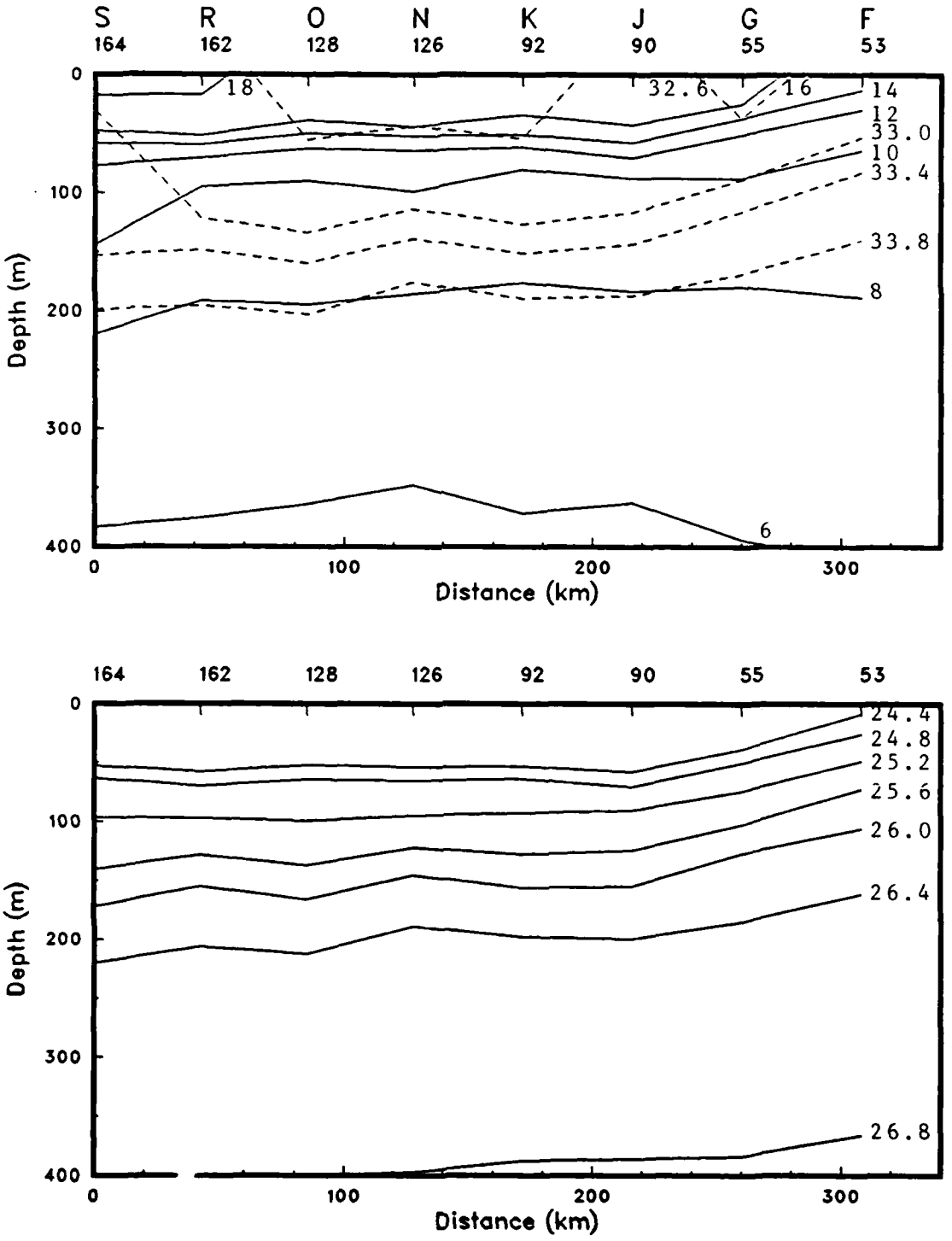


Figure 26(a): Isopleths of (1) temperature and salinity and (2) sigma-t from the CTD's (OPTOMA17, Leg DII).

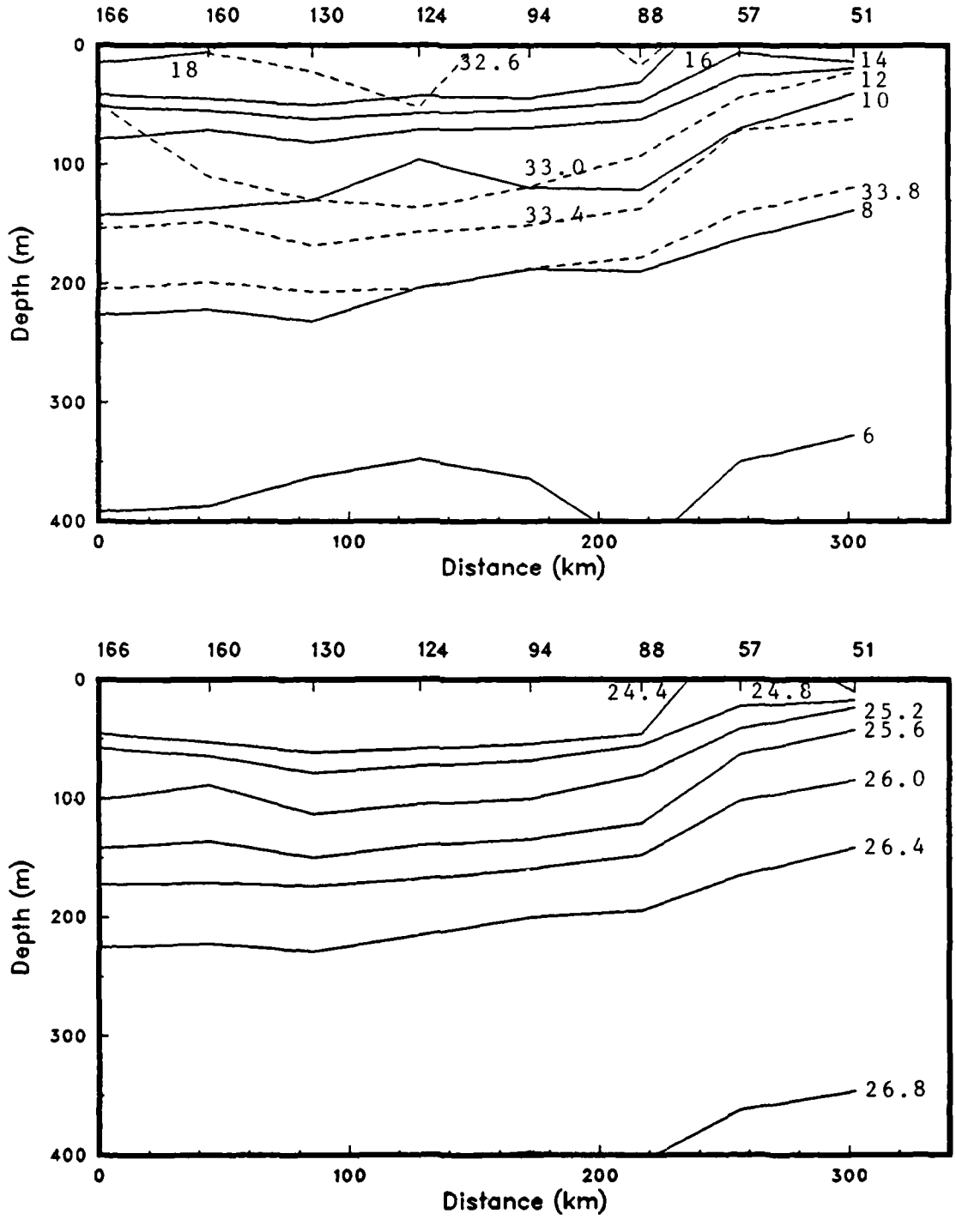

166
160
130
124
94
88
57
51
0
100
200
300
400
Depth (m)
18
32.6
16
14
12
10
33.0
33.8
33.4
8
6
0
100
200
300
Distance (km)
166
160
130
124
94
88
57
51
0
100
200
300
400
Depth (m)
24.4
24.8
25.2
25.6
26.0
26.4
26.8
0
100
200
300
Distance (km)

Figure 26(b)

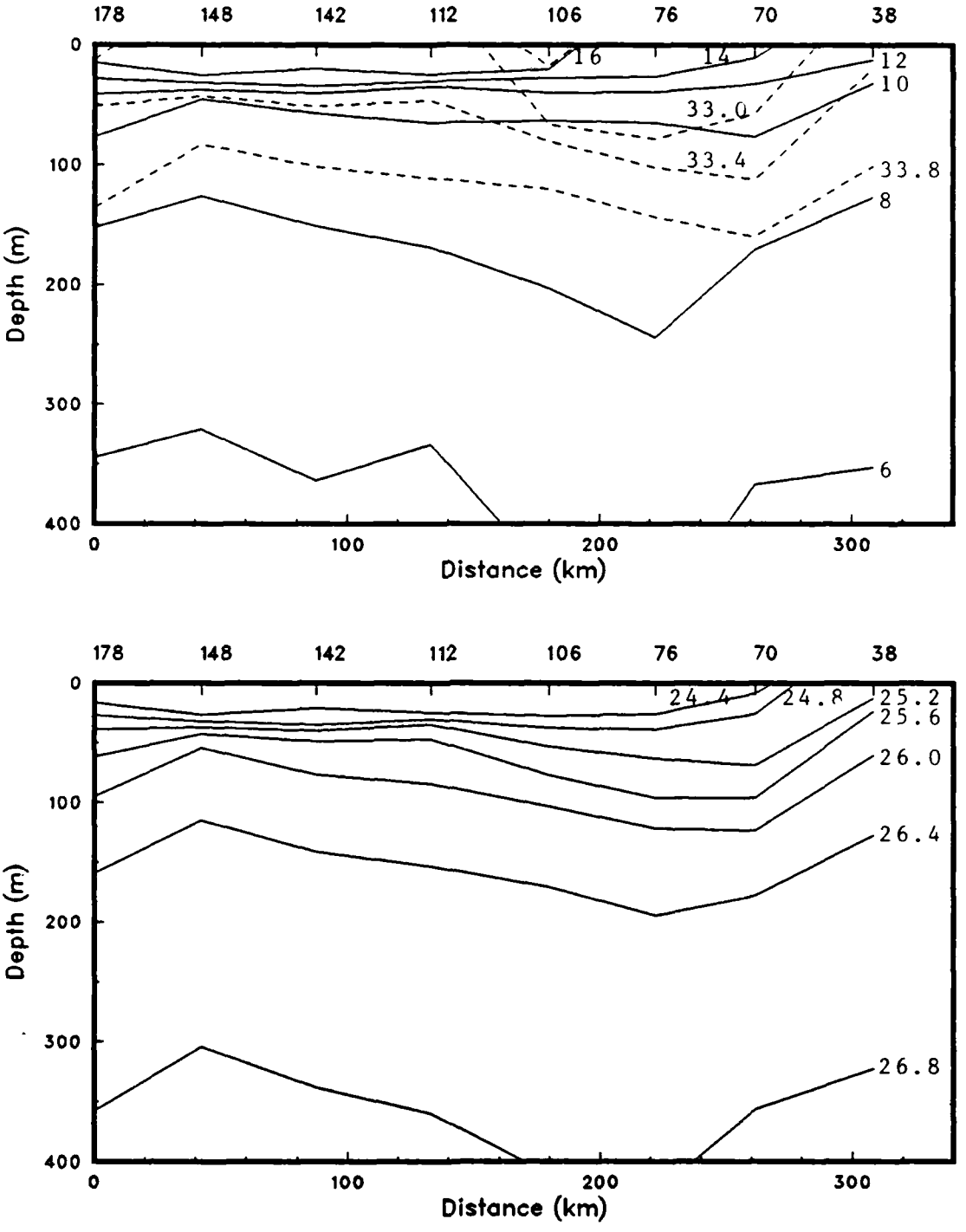

178
148
142
112
106
76
70
38
0
100
200
300
400
Depth (m)
16
14
12
10
33.0
33.4
33.8
8
6
0
100
200
300
Distance (km)
178
148
142
112
106
76
70
38
0
100
200
300
400
Depth (m)
24.4
24.8
25.2
25.6
26.0
26.4
26.8
0
100
200
300
Distance (km)

Figure 26(c)

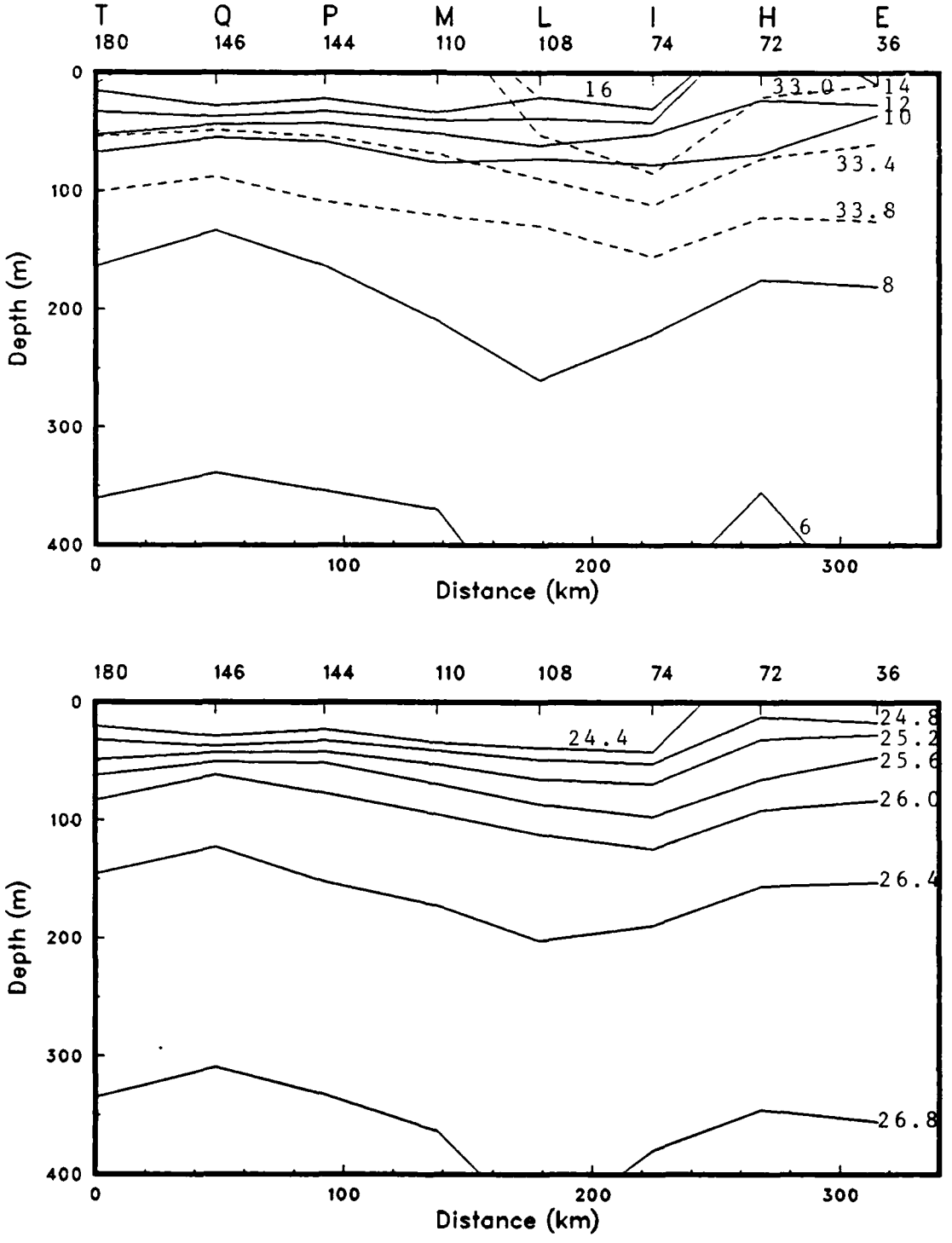

T Q P M L I H E
180 146 144 110 108 74 72 36
16
33.0
14
12
10
33.4
33.8
8
6
Depth (m)
Distance (km)
24.4
24.8
25.2
25.6
26.0
26.4
26.8

Figure 26(d)

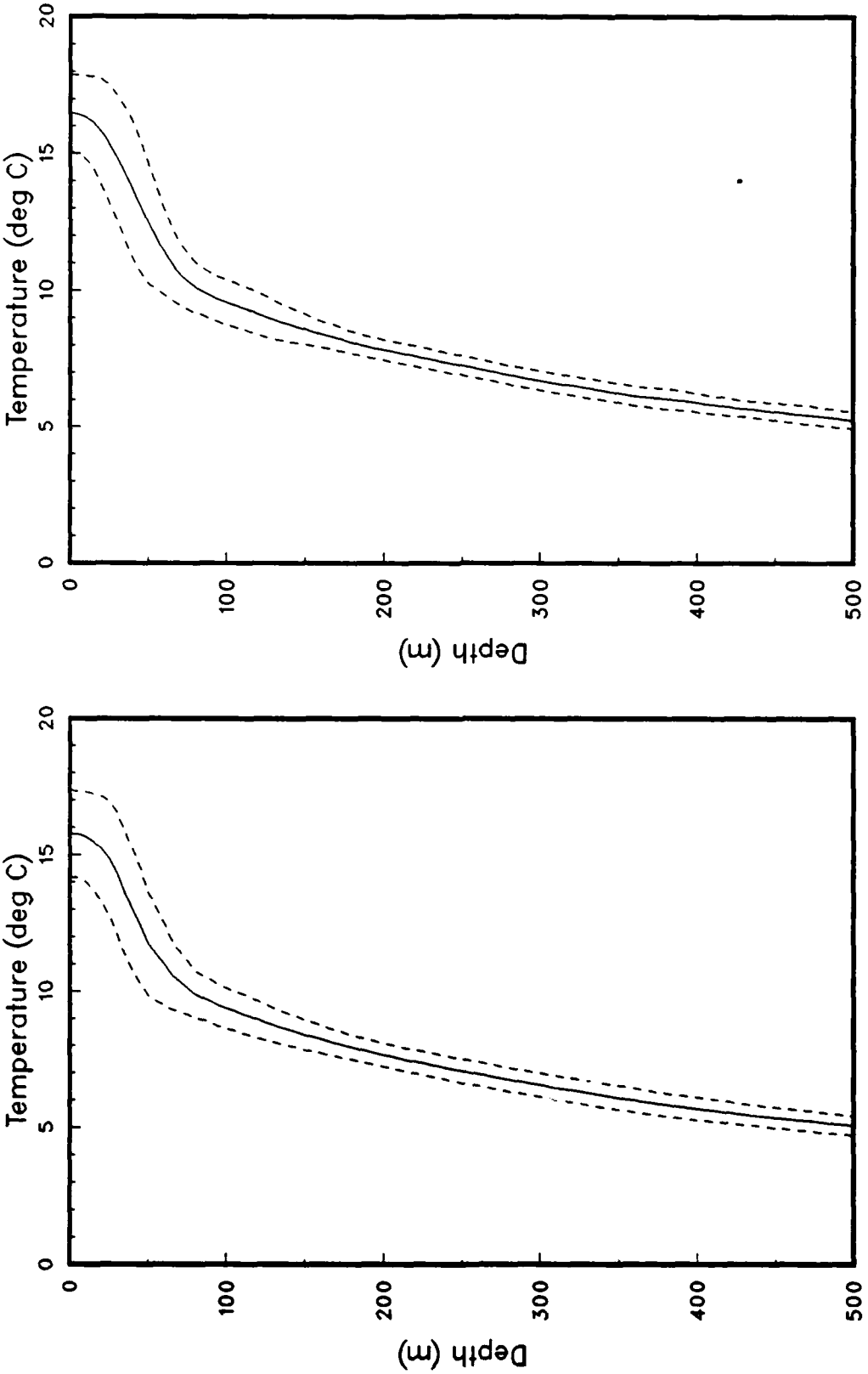


Figure 27: Mean temperature profiles from (a) XBT's and (b) CTD's, with + and - the standard deviation. (OPTOMA17, Leg DII).

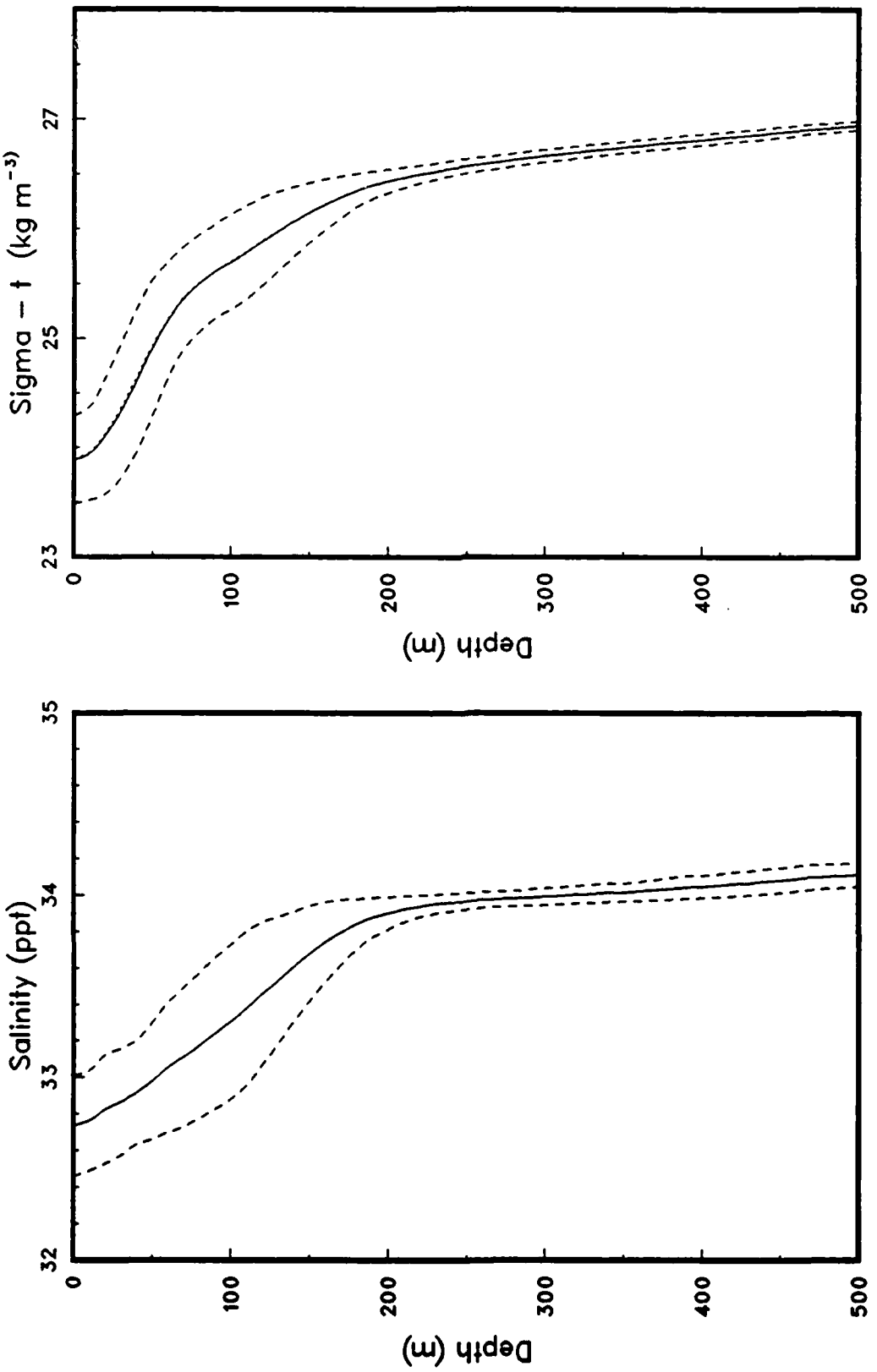


Figure 28: Mean profiles of (a) salinity and (b) sigma-t, with + and - the standard deviations, from the CTD's (OPTOMA17, Leg DII).

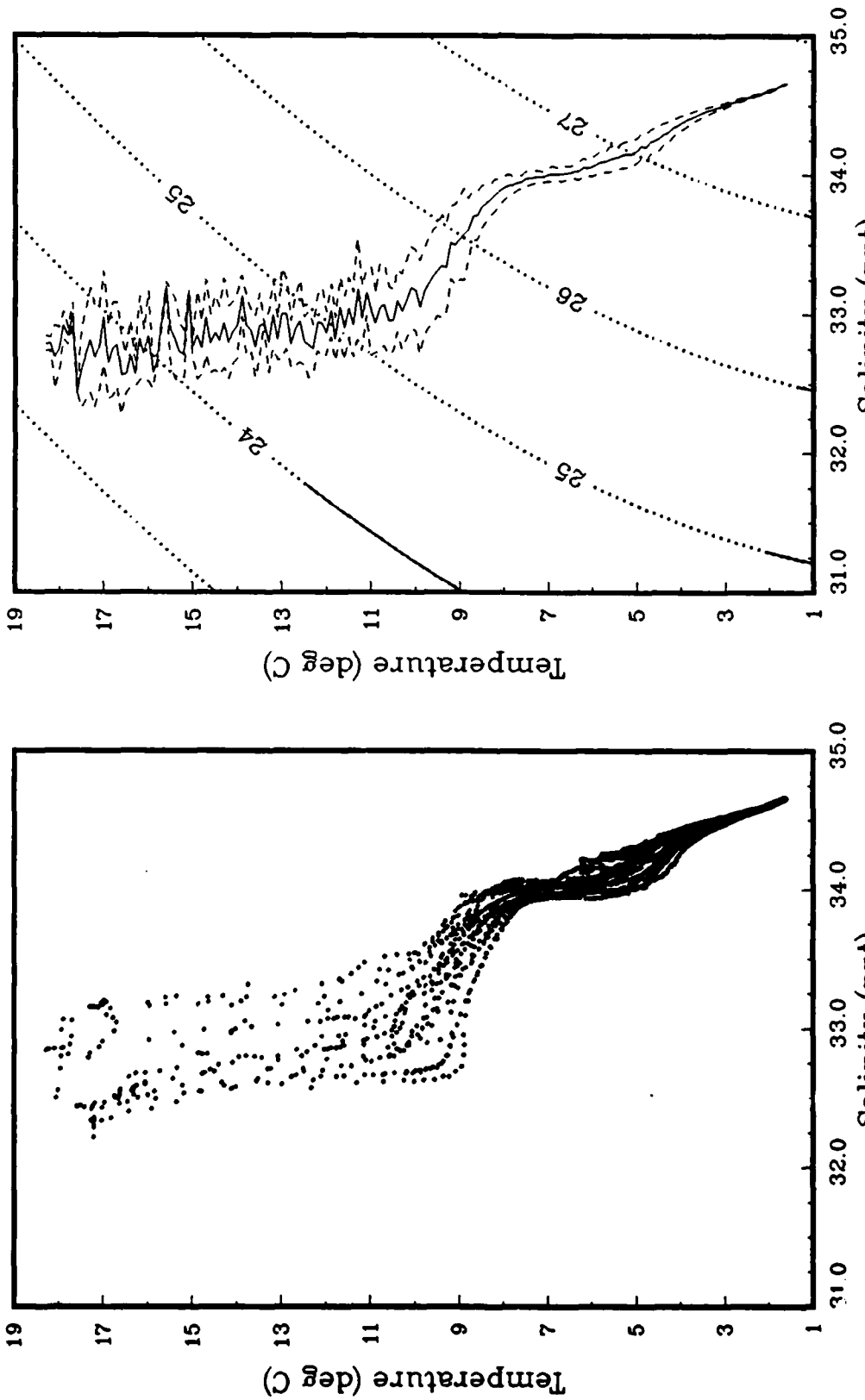


Figure 29: (a) T-S pairs and (b) mean T-S relation, with + and - the standard deviation, from the CTD's. Selected sigma-t contours are also shown. (OPTOMA17, Leg DII).

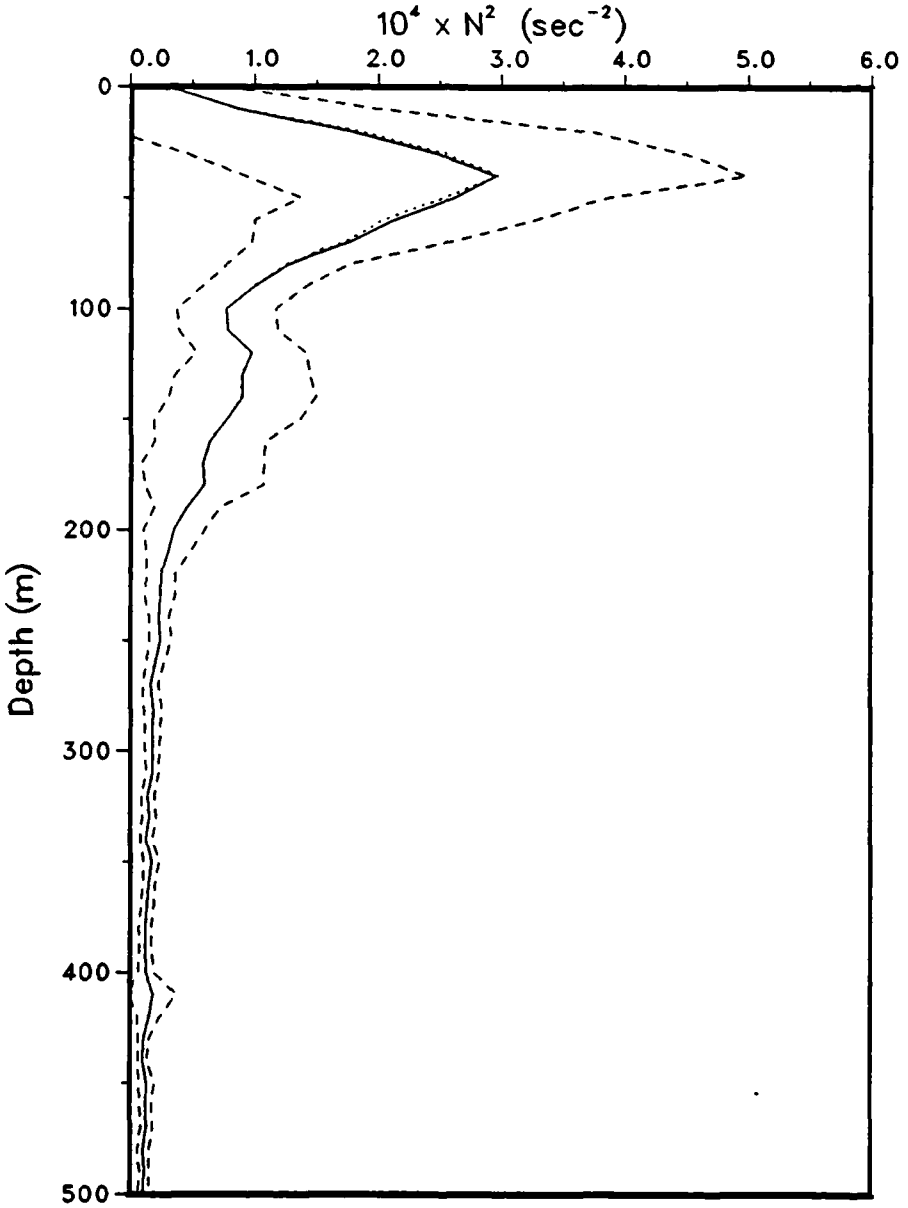


Figure 30: Mean N^2 profile (——), with + and - the standard deviation (---). The N^2 profile from $\overline{T(z)}$ and $\overline{S(z)}$ is also shown (···). (OPTOMA17, Leg DII).

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REFERENCE

Lewis, E.L. and R.G. Perkin, 1981: The Practical Salinity Scale 1978: conversion of existing data. Deep Sea Res. 28A, 307-328.

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